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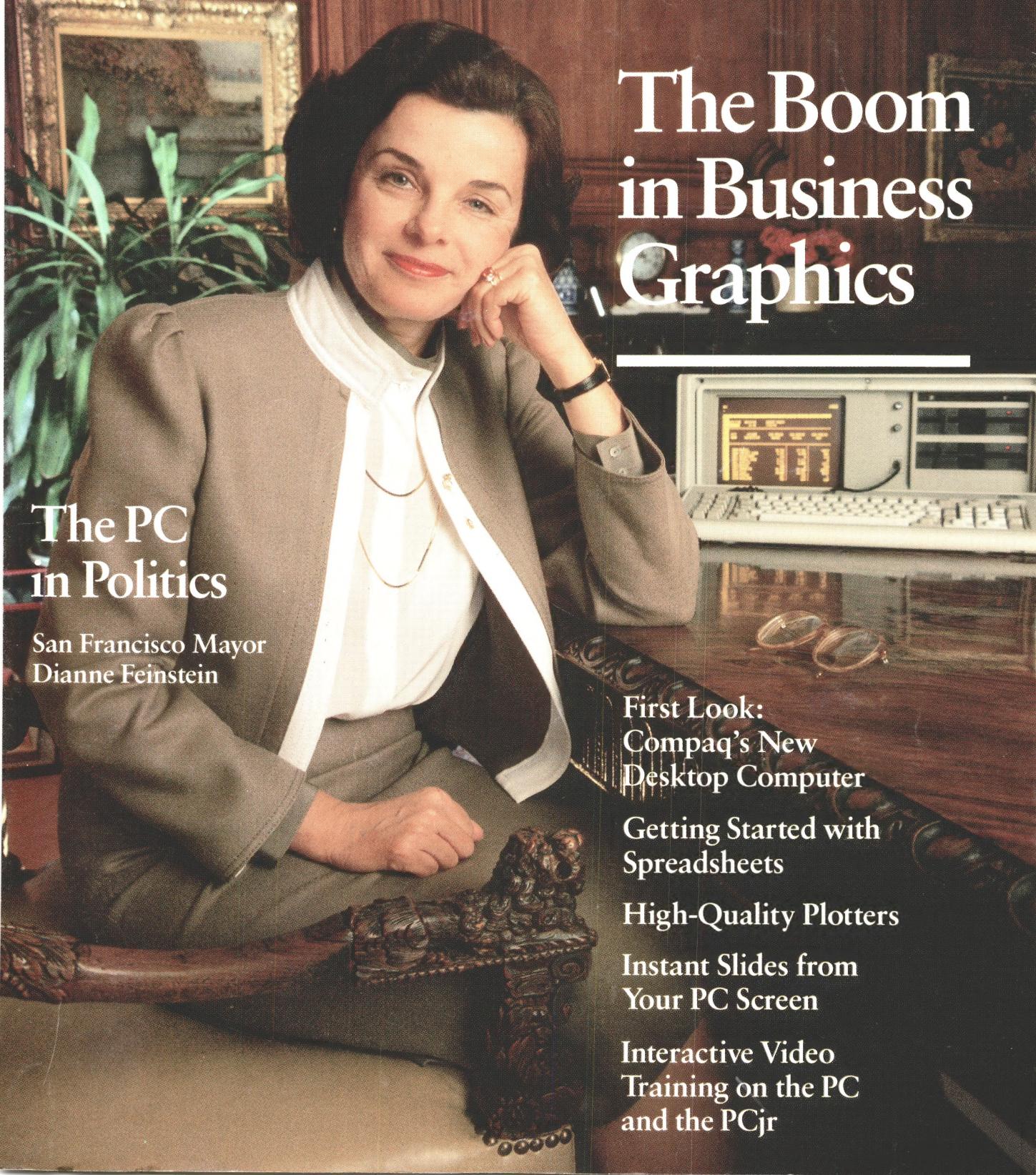
August 1984
\$2.50 International

*The Comprehensive Guide to
IBM Personal Computers and Compatibles*

The Boom in Business Graphics

The PC in Politics

San Francisco Mayor
Dianne Feinstein



First Look:
Compaq's New
Desktop Computer

Getting Started with
Spreadsheets

High-Quality Plotters

Instant Slides from
Your PC Screen

Interactive Video
Training on the PC
and the PCjr

Introducing AST-PCnet II.



Now PC networking is as easy as plugging-in your phone.

The advantages of Local Area Networks (LANs) are well known. Existing personal computers can be tied together to share information and expensive peripherals such as disks and printers.

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PCnet II, you simply insert the PCnet II board into an I/O slot in your IBM PC or XT. Then connect the PCnet II "twisted-pair" cable to the main network cable using a standard modular "telephone jack."

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We're AST, the world's leader in communications and enhancement products for the IBM PC. To find out how AST-PCnet II can expand your IBM PCs and XTs into a reliable, versatile LAN, call or write AST Research, 2121 Alton Avenue, Irvine, California 92714. (714) 863-1333. TWX: 753699ASTR UR

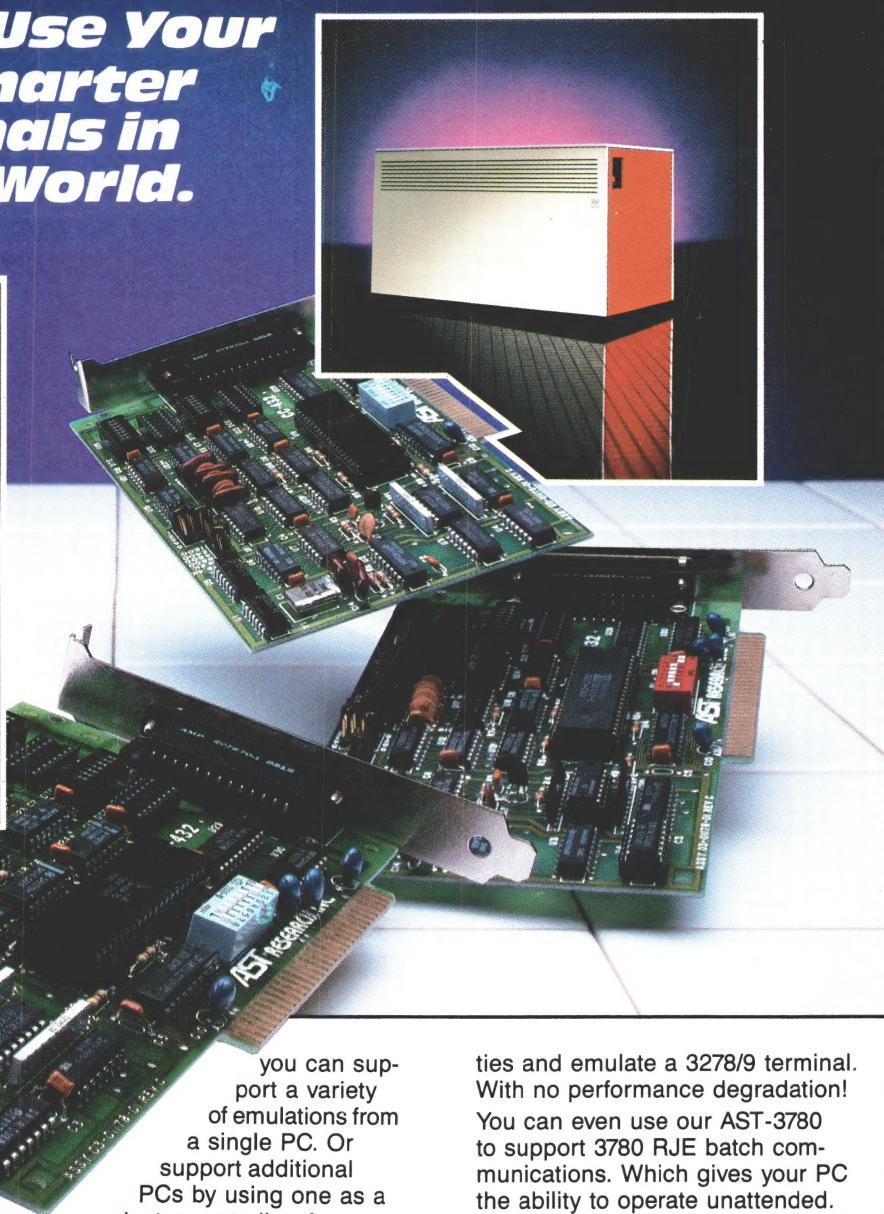
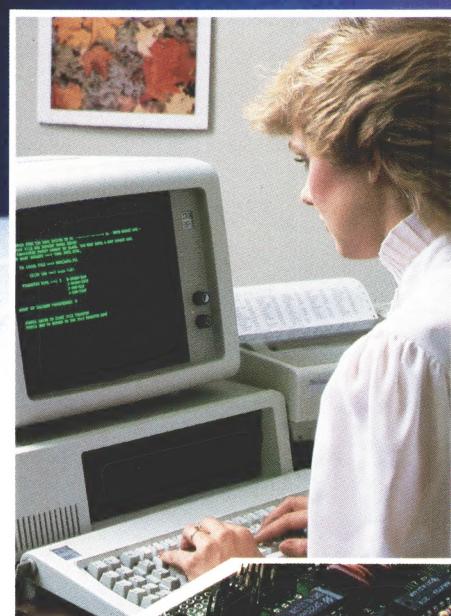
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AST-PCnet II Local Area Network

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you can support a variety of emulations from a single PC. Or support additional PCs by using one as a cluster controller. An arrangement (with up to four PCs) that can save you a lot of money. You can even attach low-cost ASCII CRTs to a PC and emulate 3278 Model 2s.

What's more, our AST-BSC package lets you work in a 3270 BSC environment and still migrate to 3270 SNA/SDLC without hardware upgrades. Another way to save money and aggravation.

Still, there's more. For example, if you have an IBM 3274/3276 Cluster Controller, our coaxial connection hardware is your answer. Once installed (via coax-A), it lets your PC retain its stand-alone processing capabili-

ties and emulate a 3278/9 terminal. With no performance degradation!

You can even use our AST-3780 to support 3780 RJE batch communications. Which gives your PC the ability to operate unattended. And transfer program, data or text files between your PCs and an IBM host at very high speeds.

AST is the only supplier that can give you a complete line of PC-compatible products. Communications hardware and software for 3270, 3780 and 5251 environments. I/O and memory expansion cards. And utility programs.

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1

AST

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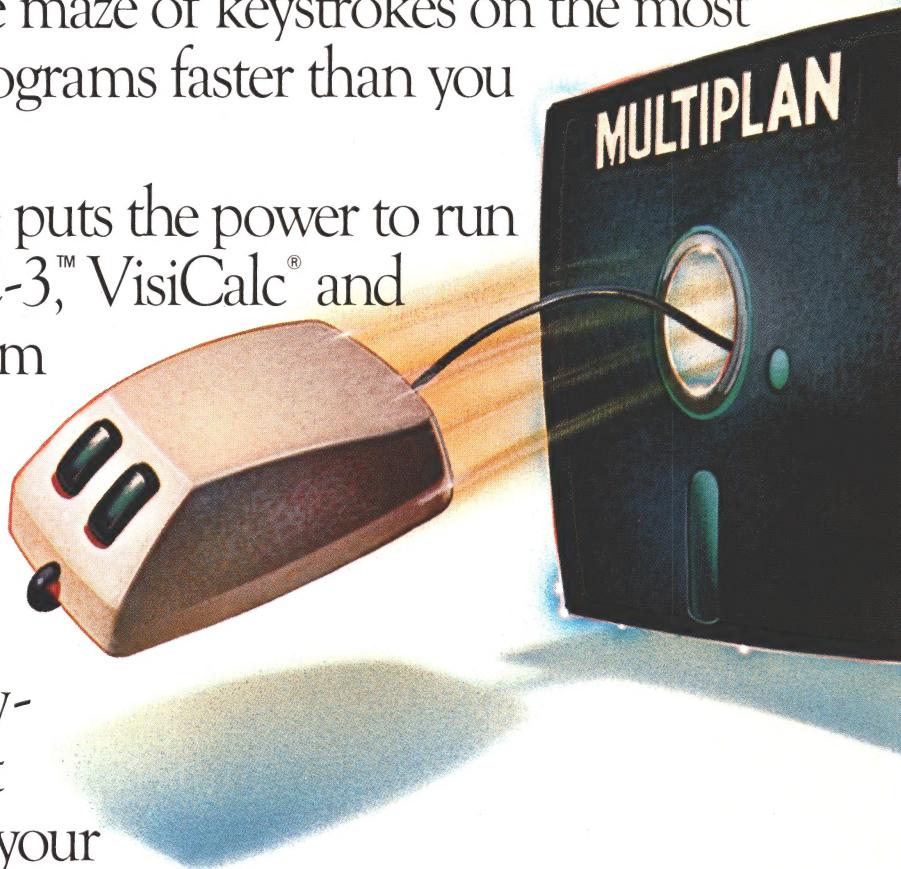
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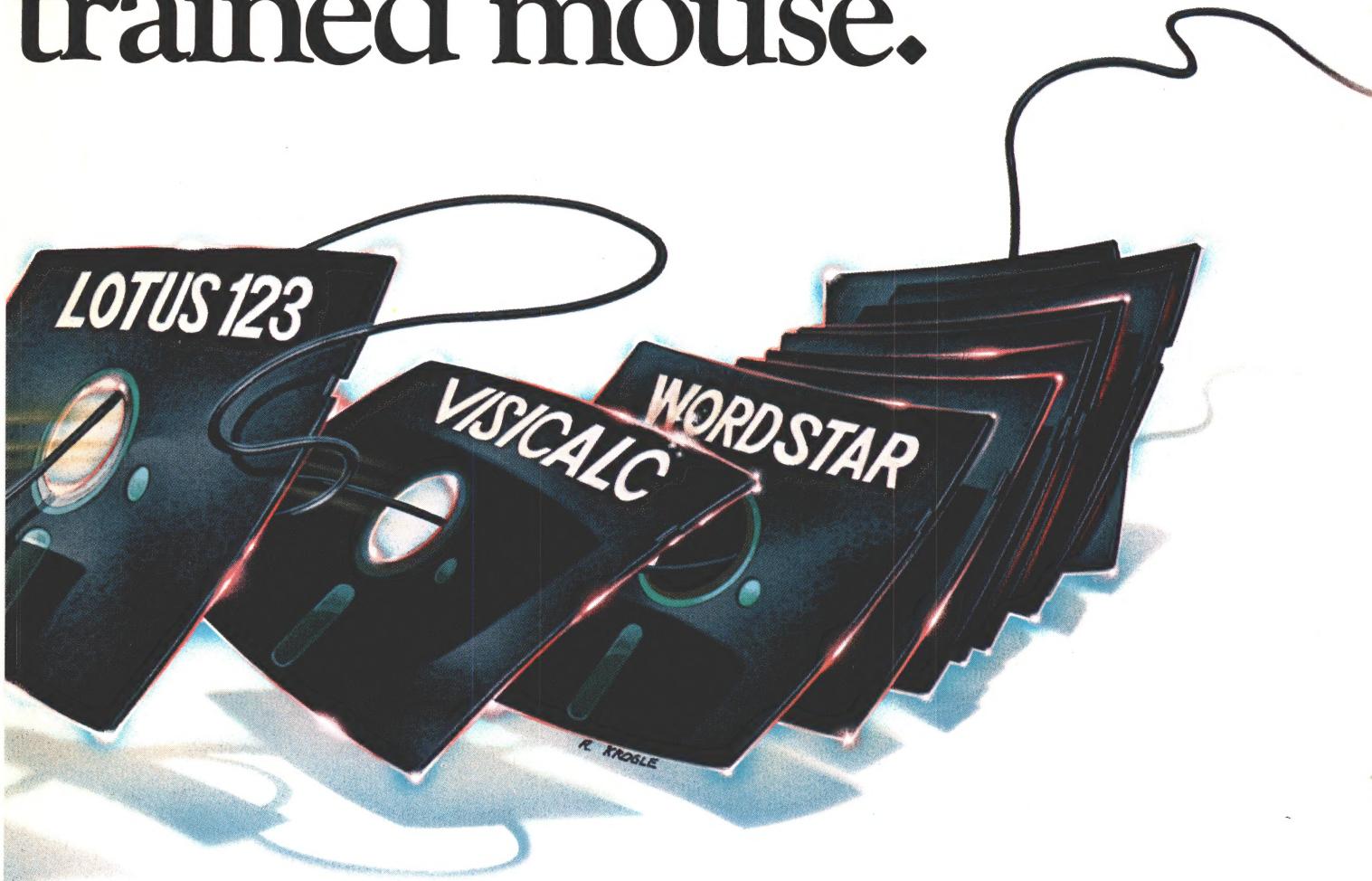
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PC WORLD

*The Comprehensive Guide to
IBM Personal Computers and Compatibles*

● Getting Started

54 The Boom in Business Graphics, *David L. Wilcox*

For presentations, reports, sales demonstrations—whenever you need to make a point effectively and immediately—computer graphics can help your audience get the picture. A look at what business graphics packages offer and tips for selecting the right program.

66 Introduction to Spreadsheets, *Harry Miller*

Any job you can do with calculator, paper, and pencil can be done faster and more easily with an electronic spreadsheet. This primer demystifies spreadsheet terminology, discusses important features, and compares the approaches of different programs.

● State of the Art

94 Compaq Settles Down and Powers Up, *Ken Greenberg*

Compaq's success with its portables has emboldened it to challenge IBM for a place on corporate America's desk tops. Introducing the Deskpro line of full-sized, modular computers.

106 UNIX Tug-of-War, *David W. Smith and Peter Marvit*

It's a battle of the giants as IBM challenges AT&T on the communications colossus's own turf with PC/IX—the UNIX operating system for the PC.

Photo/illustration credits: David Bishop, 66, 132, 208, 261; Steve Campbell, 182; Michael Carr, 94; Bill Cone, 21; David Johnson, 42, 45; John Littleboy, 106; Ming Louie, 44-45, 117, 216; Stevan Nordstrom, 248; George Steinmetz, cover; Fred Stimson, 294; Mick Wiggins, 200.

● Review

132 Pick of the Plotters, *Akshai K. Runchal, Jacob Treger, and Clement K. Tam*

Three colorful multipen plotters put punch in your presentations. Reviews of the Amplot II, the HP7475 Graphics Plotter, and the Hiplot DMP29.

152 Beyond Bar Charts, *Burton L. Alperson*

Presentation business graphics packages are becoming a necessity in today's offices. *Chart-Master* and *BPS Business Graphics* offer a variety of presentation graph types to drive your point home.

168 More Color Than Big Blue, *David McCune*

Want more pixels for your dollar? The PC Peacock and the Graphics Plus II color graphics boards offer superior resolution, plus more colors and accessories than IBM's monochrome and color graphics boards.

● PCjr World

200 PC + Video: Working Partners, *Katie Seger*

The interactive video technology that made *Dragon's Lair* an arcade smash last year should soon be adding excitement to educational and entertainment programs on the PCjr.

208 Three-Part Harmony, *Warren Sirota*

The PCjr learns to play a sixteenth-century dance while you learn about Cartridge BASIC's PLAY statement and three-voice programming.

216 Plug In More Power, *Katie Seger*

This tutorial lays out the steps for adding an expansion board and a disk drive to the PCjr.

August 1984

▀ Hands On

230 Media Conversion, *Janette Martin*

Before you get the conversion blues, explore the alternatives for moving your data over to the PC—service bureaus, telecommunications, disk conversion devices, and digitizing cameras.

242 CP/M to DOS, *Steven D. Ryals*

An Osborne owner tells how he converted to the Compaq with the help of Perfect Software's *Perfect Link*.

248 Professional Presentations, *Bill Crider*

Stage fright during business presentations can be cured with planning and common sense. A few guidelines for a fail-safe presentation.

261 60-Second Slides, *Cindy Hamburger*

Want to make presentation-quality slides of your computer screen? With the Palette, Polaroid brings its prescription for immediate gratification to the computing world.

271 1-2-3 Graphics Made Easy, *Joseph P. Celentano*

You can produce surprisingly sophisticated graphics with software you already own. Learn to use 1-2-3's graphics functions.

▀ Community

294 The New Political Machine, *Jonathan Littman*

Necessity and new software have brought the microcomputer into yet another arena—the political. The PC's tireless list-management, budget-crunching, and data manipulation abilities are making it the most popular political organizer of Campaign '84. Also an interview with San Francisco Mayor Dianne Feinstein.

311 Totally Unwarranted, *Phillip Gordon*

The disclaimers on many software packages may sound like they leave you out on a limb legally, but software manufacturers and retailers can't always avoid responsibility for their products. Find out what your rights are when the software you buy doesn't live up to its promises.

Departments

13 David Bunnell

Psychological software.

21 REMark, *Robert H. Glidden*

Outlook for software independents.

31 Letters

42 PC World View, *Miriam Medom and Katie Seger*

News and notes for the computing community.

81 The Help Screen, *Karl Koessel*

Your PC enigmas unraveled.

116 Compatibles Update, *Ken Greenberg*

News from the world of PC work-alikes.

182 From the Software Shelf, *Edited by Robert Luhn*

First impressions of recently released software products.

280 *.*., *Edited by Steven Cook*

A global exchange of personal computer discoveries.

342 Just Announced, *Edited by J. Schaffner*

The wide world of IBM PC products.

Indexes

356 Advertisers

358 Products

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You'll also find DisplayWrite Legal, a dictionary of about 16,000 words that a lawyer might need to check.

And you'll find DisplayComm, which lets your IBM PC send and receive text to and from other IBM PCs. If you're writing at the office, this program could also let you send text to an IBM Displaywriter down the hall. (From there, it could be sent on to an IBM host computer for distribution.)

Some words on high function.

The DisplayWrite word processing programs give you the time-saving features you'd expect from IBM. Justified margins, centered lines and pagination, for example. You'll even have prompts and messages to help guide you along.

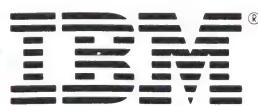
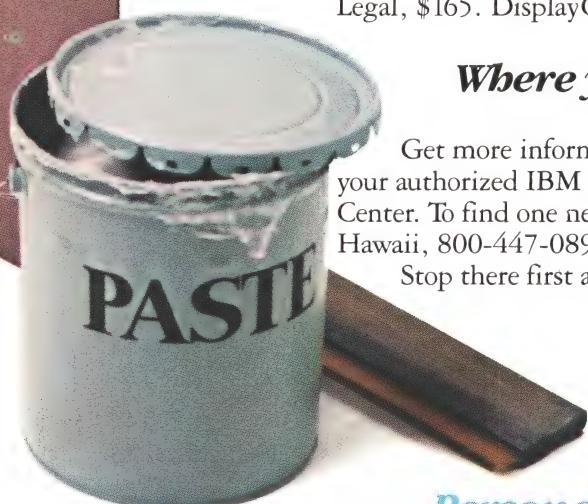
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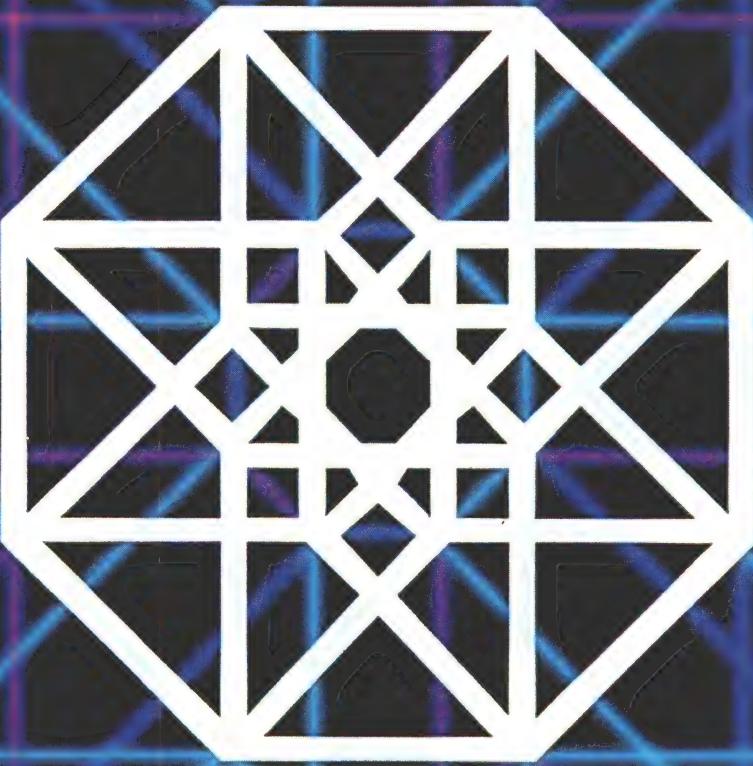
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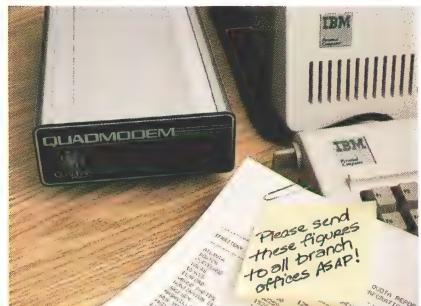
Now Quadram applies their expertise to communication devices. Not just modems, but a full range of other products, too. So that you can do anything from networking many PC's together to giving your PC full 3278 terminal emulation in an IBM mainframe environment.

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2. Quad3278™ Let an IBM PC communicate with an IBM mainframe.



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3. Quadnet™ Turns your IBM PC's into a Local Area Network.

Local Area Networking (LAN) is one of the most interesting and useful ideas to come

down the pike. Basically, it allows you to inter-link a group of computers together so they can share information and peripherals with each other.



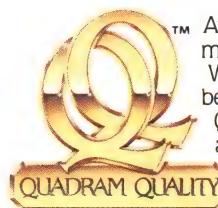
And now with Quadnet, you don't have to compromise your system to fit our system. Instead, you can easily link as few as two, or as many as 255 IBM PC's together in a hard-wired network. And you can configure them almost any way you want. They can work independently of each other or share resources and peripherals.

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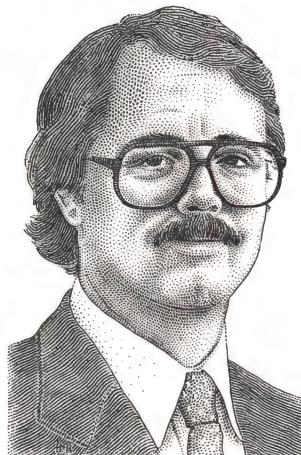
Circle 6 on reader service card



Searching for the Next Generation of Software

At some point in the life of every creative enterprise, it runs up against a wall, and what was once a good idea is battered beyond recognition. Doctors run the same experiments, politicians make the same promises, and programmers design the same software. Although the ideas may differ in practice and presentation, in essence they are all the same. As I consider the wealth of available software, I'm amazed at how boring the personal computer industry threatens to become if the applications remain largely confined to so-called productivity tools.

Word processors, spreadsheets, data base management systems, and communications programs currently dominate the market. They are constantly updated and integrated with each other in endless arrangements. Many new application packages are spin-offs of those already on the market. If the trend toward software sitcoms continues, we will see windows of data within windows of data outside of windows of data. The personal computer will take on many of the dull, repetitive characteristics of television—which would be a shame, since PCs have so much more to offer than "That's Incredible."



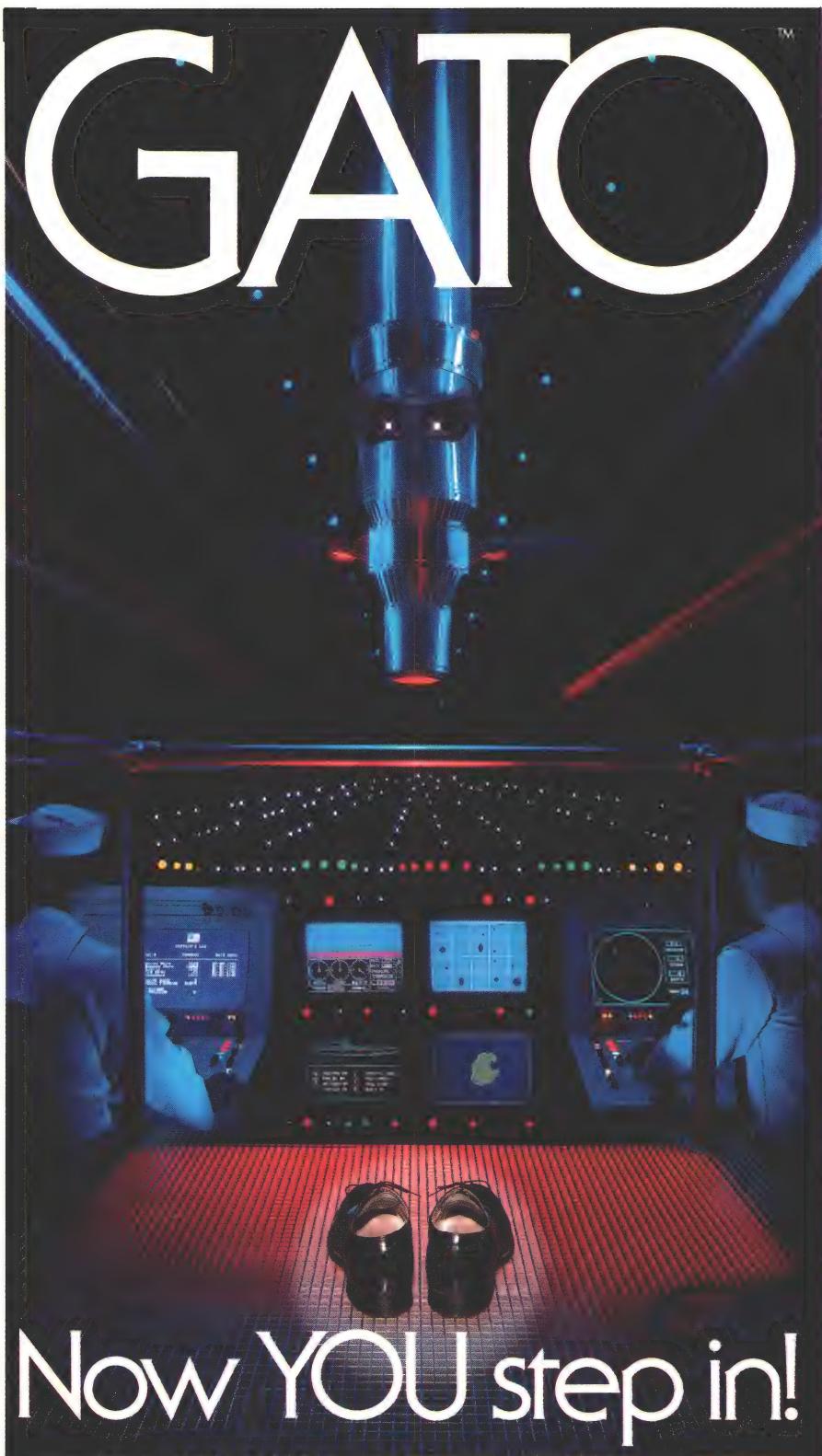
At a recent personal computer trade show I stopped by the Human Edge booth and tried out a piece of software that answered my prayers for some sign of life after spreadsheets. *The Sales Edge* takes applications software one step further by analyzing data to assist a sales professional in preparing for a presentation to a client (see "Perfect Pitch," PCW, Vol. 2, No. 7).

The program was designed by Dr. James Johnson, a clinical psychologist who left his position as a university lecturer to enter the world of personal computing. As founder of Psych Systems, he originally blended programming and psychology to develop a system to analyze patients. Dr. Johnson is applying the same idea at Human Edge, but it is aimed at an audience less versed in clinical psy-

chology. *The Sales Edge* and *The Management Edge* offer users general strategies to approach sales and business situations.

I tested *The Sales Edge* and found it both easy to use and fast. The program runs through a series of questions about your personality—your likes, dislikes, and typical reactions to certain situations—and then poses a similar set of questions about your intended customer. The system classifies you and your customer into 1 of 12 personality types, whips through a compilation of papers and psychological techniques, and selects a tactical approach tailored to your particular situation.

The question-and-answer session took about 15 minutes. I set up a hypothetical situation that included myself and a friend. To add to the suspense I pretended that we were involved in a gigantic transaction with millions of dollars at stake. The results were printed out instantly, restrained by only the printer's speed. To my amazement, the program's suggestions were applicable and sensible. Even if I didn't plan to follow the program's advice, it took me through a useful, analytical, and enlightening process.



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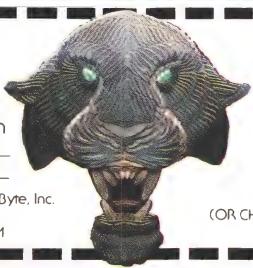
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Circle 589 on reader service card

David Bunnell

I'm sure that on many levels the program might be judged superficial and overly general. But it utilizes the PC's ability to sort and find in a new way. The key point is that even if *The Sales Edge* doesn't outsell 1-2-3, it opens the door to a whole new genre of personal computer applications—just as the Altair provided the gateway to microcomputing. By applying the psychological touch to their programs, software developers can propel personal computing into the first level of artificial intelligence. The logical assessment of data allows the PC to act as an advisor, a thought facilitator, and a personal consultant.

The potential range of applications for this kind of software is remarkable. As a personal consultant, your PC can act as a tax advisor, a marriage counselor, a health administrator, a stockbroker, or a foreign language teacher; its versatility is limited only by your needs and willingness to experiment. When the full potential of the personal computer is revealed, people who don't tap into this resource will be forever hindered. Those who still think personal computers are only a fad will have to think twice. The pendulum of public opinion will inevitably swing back, and people will be afraid to be *without* a personal computer. Once it survives the period of transition and achieves full acceptance into the mainstream, the PC will become a permanent ally to humanity and will constantly expand in utility and creative application.

The addition of this psychological touch to the software field marks the creation of a new generation of programs—a second species, one that many fear is reminiscent of Dr. Frankenstein's monster. The doctor's initial dream dissolved into a nightmare as the creature took on a life of its own. But while we still have control and foresight, we can create genies rather than monsters. The little magical guy in the bottle has moved onto a silicon chip, but it's still up to us to use or misuse him. ☀

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Printer Port	YES	OPTIONAL	YES	OPTIONAL
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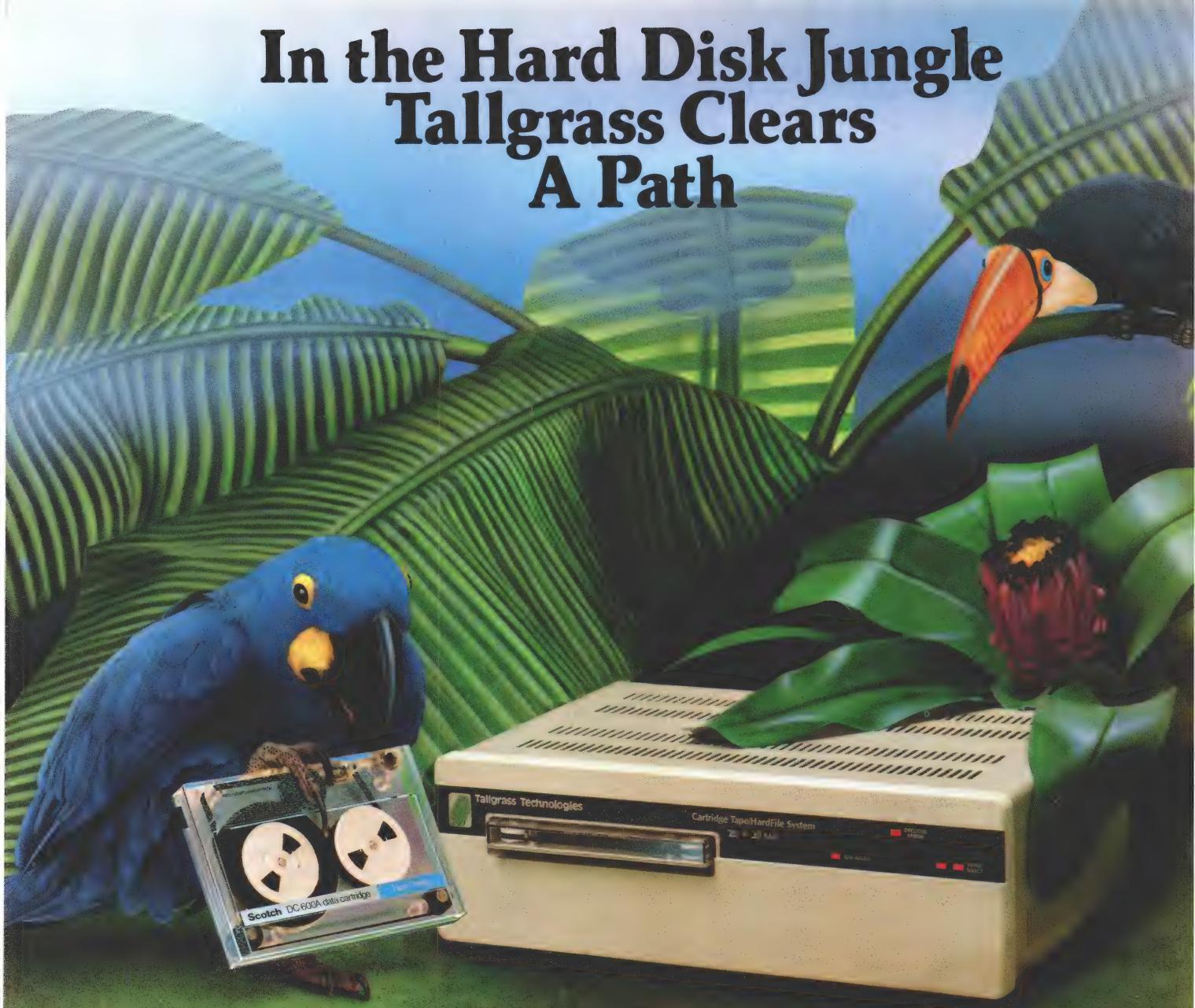
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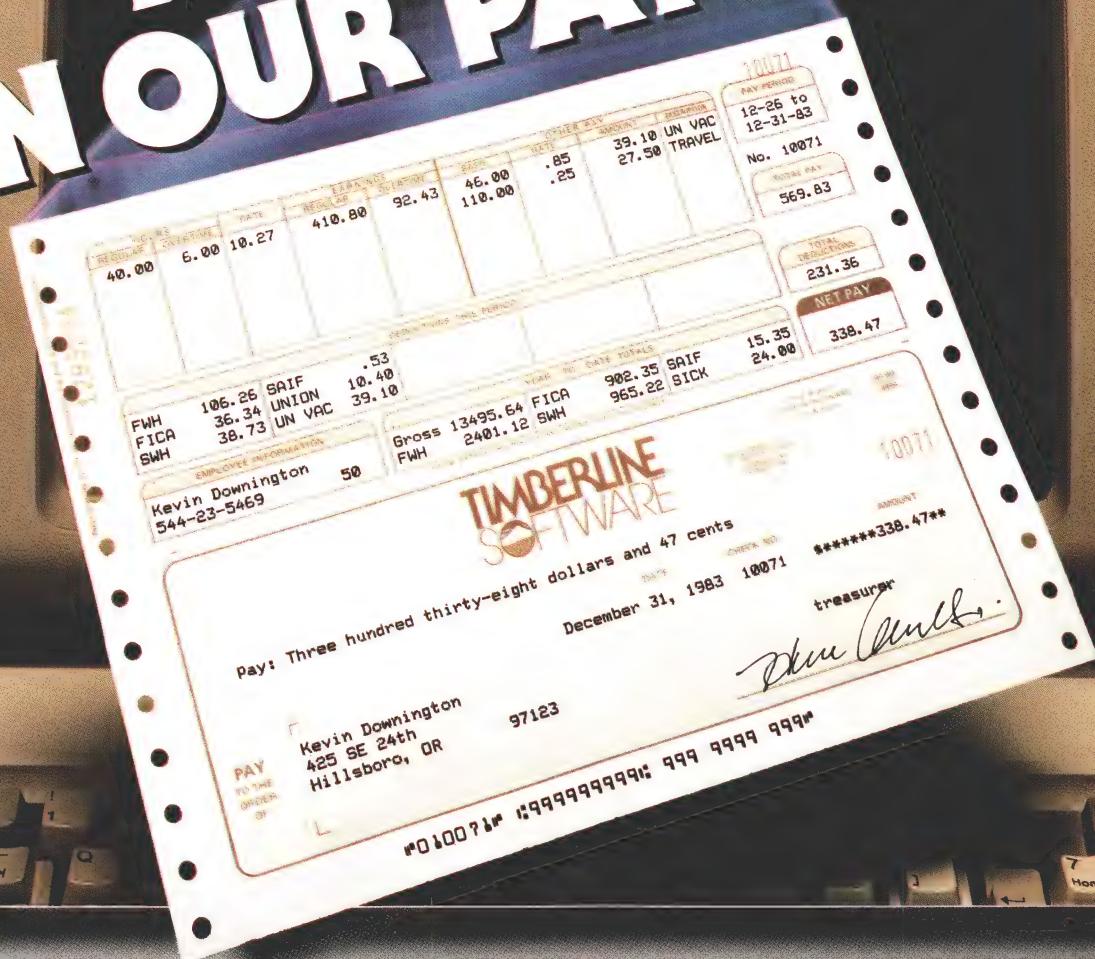
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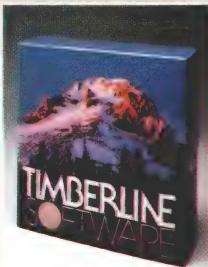
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Software Independence

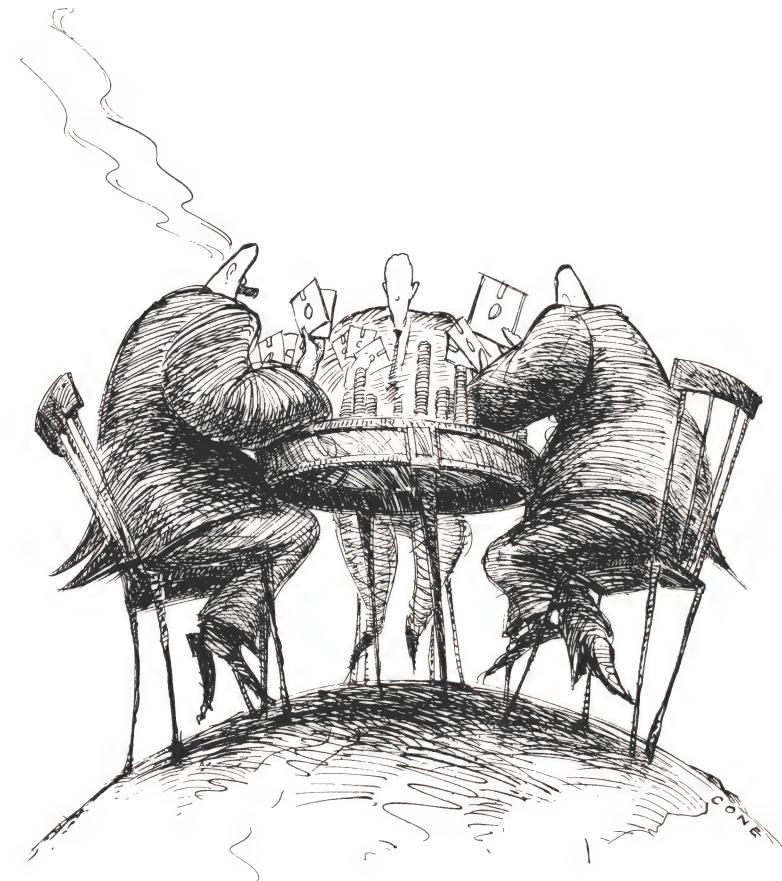
To see where the computer software industry is headed in the next six years, we must first look at where the hardware industry is going.

There are now an estimated 150 microcomputer companies battling for a market that doubles annually. Some industry watchers expect that only about ten firms will last through 1985. Those predictions may be overly optimistic.

The much-predicted shakeout can be described very simply: the role of grim reaper belongs to IBM. According to some reports, IBM will account for half the world personal computer market by 1985, with IBM clones taking another quarter. Now comes the new development: IBM will not repeat in the micro market the pattern of dominance it set with mainframes. The evolution of high technology, plus a combination of circumstances, will break the pattern.

The Big Three

Once upon a time there were many auto makers; in a matter of decades, nearly all had fallen. We're now seeing, in a different industry, the rise of another big three. Two are American; they can be summed up in six letters: IBM and AT&T. The third I describe as Japan, Inc., or simply Japan. The other competitors in the



microcomputer industry will have to learn to play the game by the rules of the big three.

The three giants are positioned by circumstance and by nature to conquer the marketplace. The market demands integration, mass marketing and distribution, and the creation of standards. These three marketing giants are primed to oblige.

All three have a similar method of operation: each waits outside a market until the market is clearly established and then moves in and takes over. The implication is that their strong suit is not in developing a new product or market—although they can and have done so—but in marshaling their huge organizations to systematize the marketing of a new idea.

Inevitable IBM

Many people put IBM in the same category as death and taxes: inevitable. But those people sometimes forget why IBM's entry into the micro market was so successful.

Back in 1981, IBM saw micros as the wave of the future, and it knew that it could make its perception a self-fulfilling prophecy by simply entering the market. In this sense IBM traded on its size and reputation. But it also entered with a 16-bit machine. By doing so, it upgraded and redefined the market it was entering. IBM has in part addressed the industry's need for standards by simply becoming the standard.

REMark

AT&T Emerges

IBM and AT&T weren't born as rivals; each grew so big, however, that one bumped into the other. AT&T—Ma Bell—had become so ungainly that the Justice Department decided to whittle it down to merely gargantuan size.

As the country automates, telecommunications is becoming an essential medium for conducting business and other activities, an essential part of the office of the information age. AT&T, which still owns the massive Western Electric and Bell Labs subsidiaries, is the world's largest telecommunications company.

Now that it cannot serve local phone customers, it's looking around for something else to do. Thanks to deregulation, it can do almost anything it wants, and it's in a superb position—because of its outstanding research, manufacturing, and marketing capabilities—to advance in the field of computers, as it began doing last March.

Japan, Inc.

The third major player in this Brave New World is not one company but a group of companies that spans a number of industries. It is, in some ways, an oversimplification to speak of Japan, Inc., as if there actually were such a monolith. But by virtue of their similar methods and their national insularity, the Japanese high-tech companies act as a single force on the world market.

Japanese computer industry sales are rising at a rate of 15.2 percent a year—faster than Japan's GNP. The Japanese have been consistent. In the best tradition of IBM or AT&T, they target a market, prepare to assault it, and then wait as long as necessary, even at considerable sacrifice, for their best opportunity.

Each of the big three stands poised to smother any rival that appears threatening. How they will fare in

head-to-head competition remains to be seen. Unfortunately, one of their first big battlegrounds will be the turf currently inhabited by the software industry.

Maintaining Independence

The further we move into the information age—that is, as computers become more available to the general public—the more software rises in relative importance to hardware. For that reason I believe the big three will next target the software industry for conquest. They have the ability, the motivation, and the inclination to do so.

The big three will enter the software market in part to fill a vacuum—one created by the changing needs of the consumer. Today's personal computer users, whether at home or at work, want a higher level of standardization and user-friendliness than small, isolated software companies may be able to provide.

The fact that software drives hardware is last year's news. The fact that the big three will try to use proprietary software to accelerate hardware sales and to compete with each other is the real issue that we face for the remainder of the decade.

AT&T, IBM, and Japan, Inc., have monetary resources and marketing power. They will make some of the best software available for their hardware, sell it at an affordable price, but keep their systems as open as possible to provide consumers with the software they want and to keep software manufacturers from flocking to other companies.

Software Strategies

So what strategies should software companies follow in the 1980s as they face a hardware environment dominated by giants that have the ability and competitive impetus to enter the software market? Software companies can emphasize three areas: product strategy, technology, and marketing.

The first testing ground for independent software companies is to adapt to the new user. That means

going beyond user-friendliness as we know it to the point at which we have software that works as easily as a TV or a stereo. For independents, the bad news is that achieving such a level of user-friendliness will not be easy. The good news is that if anybody can do it efficiently and well, independent suppliers can. The key is creativity.

I don't deny that AT&T, IBM, and the Japanese are capable of creativity. But history has shown that smaller, independent organizations are more creative and have greater success than larger, bureaucratic organizations in turning out unique products.

I offer one main technological theme: successful independents will be those who achieve a high degree of portability. *Portability* means that a program can be run on a wide variety of machines. It doesn't make sense for IBM or the other giants to develop highly portable software, because they want their software to give them a marketing edge with their hardware.

Finally, the successful independent has to be willing and able to adapt quickly to the software developments promulgated by the big three. What will distinguish the successful software company from the mere survivor will be that company's ability to adapt in four broad marketing avenues: domestic retail, OEM sales, national accounts, and international accounts.

Following these strategies will require versatility, adaptability, and what is perhaps our greatest resource, creativity. The bottom line for independent software manufacturers in the face of the big three is expressed by a line from the Broadway musical *Annie Get Your Gun*: "Anything you can do I can do better." ☀

Robert H. Glidden is former co-chairman of Perfect Software, Inc., in Berkeley, California.

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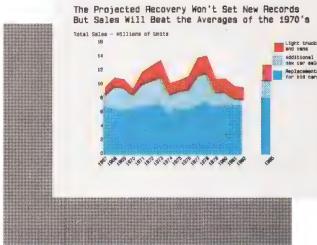
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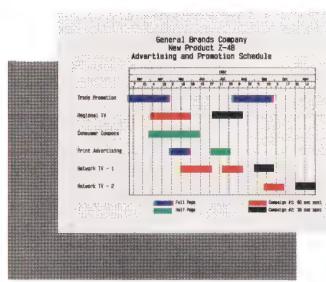
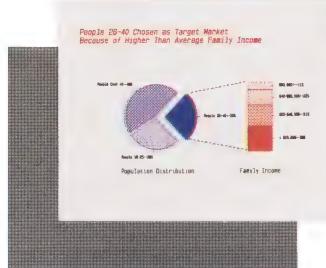
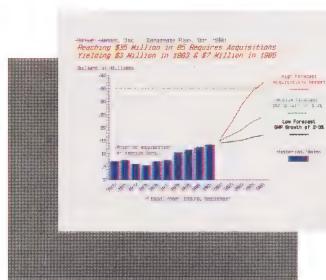
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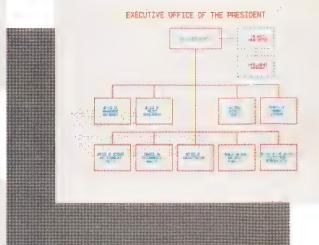
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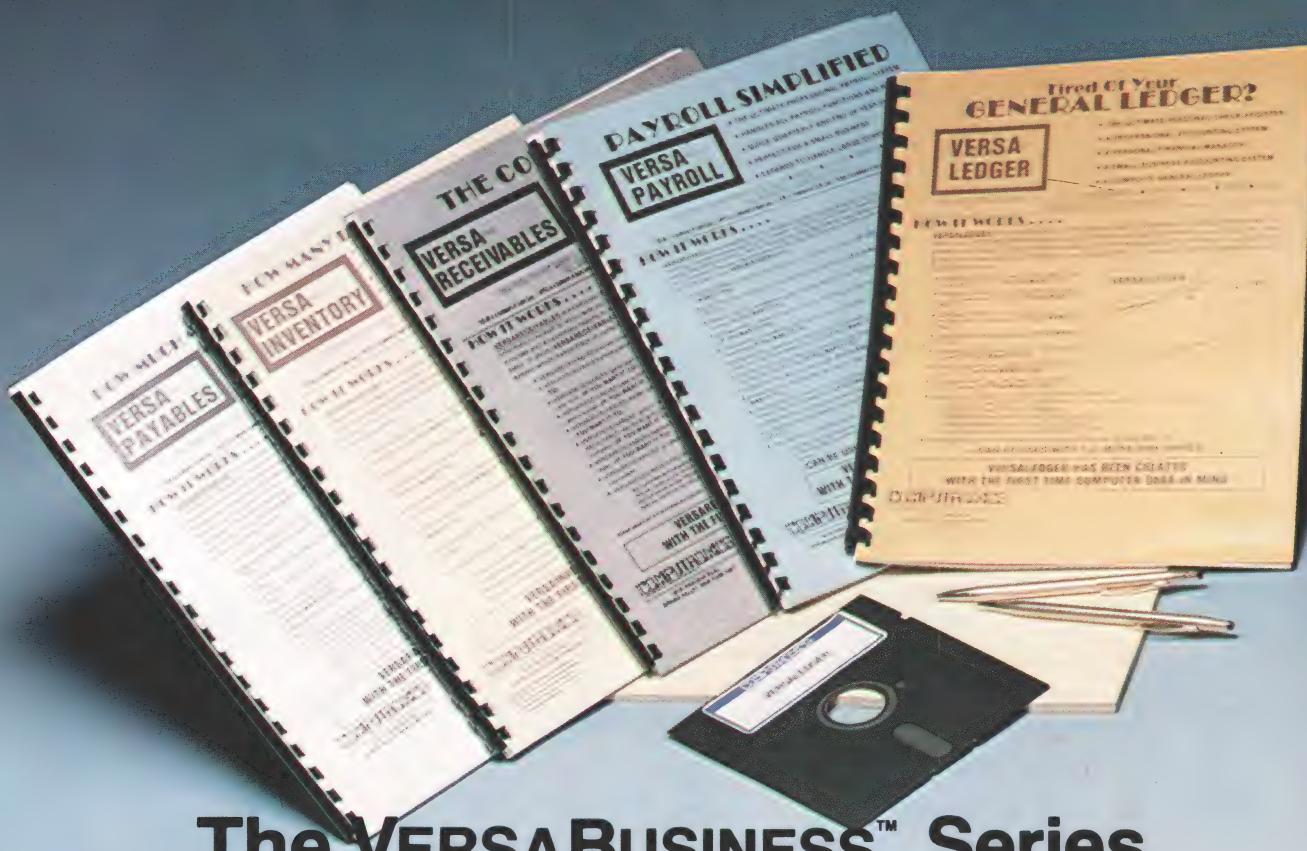
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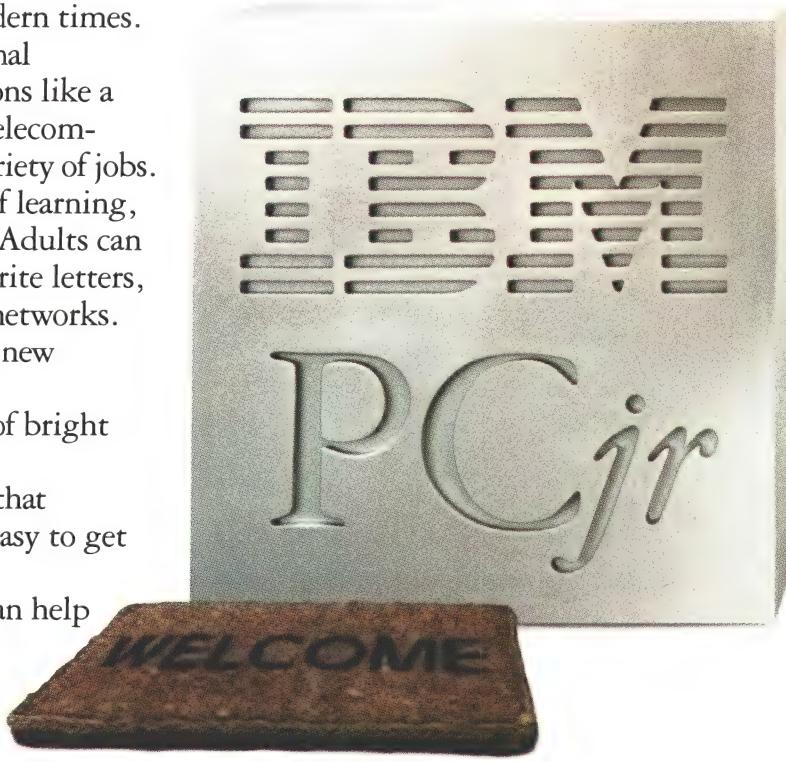
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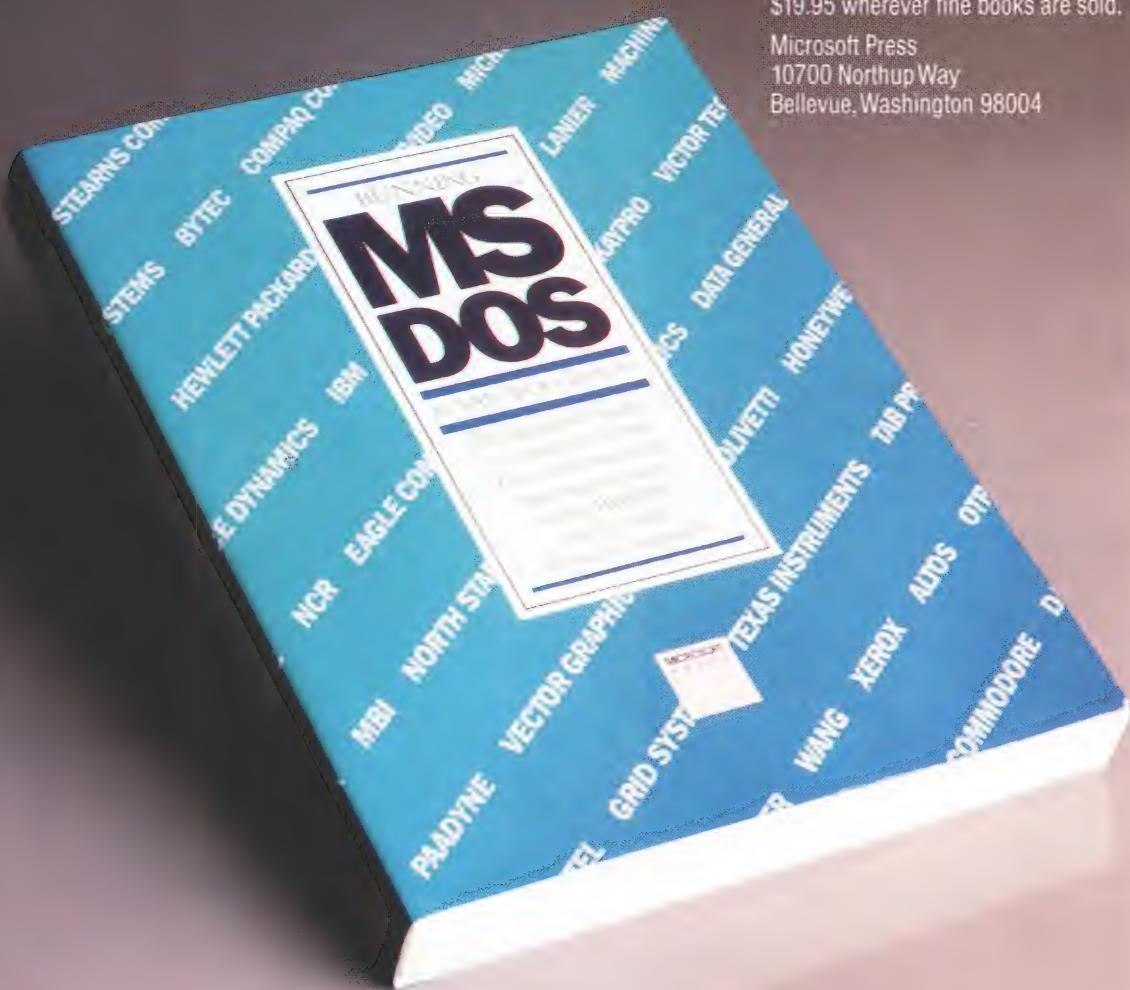
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Letters

Major Differences

Major B. L. Olmstead's *REMark*, "The Knowledge Workers," [PCW, Vol. 2, No. 5] contains a number of flaws characteristic of trend-spotting discussions of the social impacts of technology.

What is the "sheer momentum of technology" he speaks of, and why will it "force a revolution in the office and society of the 1990s"? How will the "automated economy ... integrate itself into society"? The microcomputer phenomenon is about five years old, possibly less. Ascribing to it the status of a force of nature (never mind endowing it with human qualities) is at least premature.

Assertions about the productivity capabilities of computers are a more serious problem. Sure, microcomputers allow you to do a lot more things in a lot less time, so for individuals they're more productive. But how about for corporations? It's at least arguable that the major impact of office automation is the replacement of cheap labor by expensive labor.

Also, there's no evidence supporting the telecommunications/transportation trade-off Olmstead speaks of. My own research suggests that only about 2 million workers in a labor force of 120 million will be "telecommuters" by 1990: it's too expensive even in the best of forecasted circumstances. Finally, Olmstead's labor force analysis is just wrong. Greater numbers of economists are arguing that blue collar workers will constitute about 50 percent of the labor force indefinitely.

Kenneth R. Donow
Elmwood Park, New Jersey

The Xeno Copies

I have just read the review "The Compatibles Line Up" by Robert Luhn [PCW, Vol. 2, No. 4] and found it very illuminating. However, in the course of the article Mr. Luhn refers to *Xenocopy* as the acid test of compatibility and states, "Predictably, none of the compatibles, including the Compaq, could run *Xenocopy*." The documentation [for *Xenocopy*] put out by Vertex Systems mentions that *Xenocopy* will run on the Columbia, Corona, Hyperion, Sperry, TeleVideo, Chameleon, Compaq, and Tava compatibles (among others). Mr. Luhn states that each of the above machines could not run *Xenocopy*. Could you please explain this discrepancy?

James R. Weiner
Brussels, Belgium

The version of Xenocopy used in testing compatibles was an early-release, PC-specific package. Vertex has since released a version of Xenocopy that will work on the compatibles you mention. (See Compatibles Update, PCW, Vol. 2, No. 7, for more details.)—Ed.

Hyperion à la MODE

Your low estimate of IBM compatibility for the Hyperion ["The Compatibles Line Up," PCW, Vol. 2, No. 4] seems to indicate that your reviewer did not fully understand the use of the [Hyperion's] unique MODE command to modify the screen display. This command allows the Hyperion to handle software designed for either a monochrome or a color graphics adapter, to use IBM or ASCII character attributes, and to otherwise customize processing opera-

tions. Since the Hyperion normally defaults to a color graphics mode (unless changed on the system disk by MODE), WordStar probably didn't work because it requires the monochrome display mode. I have personally used WordStar 3.3 with the high-resolution Hyperion screen, and it was easy to read and quite fast in execution.

Craig D. Venator
Decatur, Georgia

Combination Key Conundrum Continued

In the May 1984 issue of *PC World* [Letters, PCW, Vol. 2, No. 5], Robert A. Hurlbert's letter discusses the use of a Radio Shack device to hold down the <Alt>, <Shift>, or <Ctrl> key. While the \$7.95 price is attractive relative to that of RoseSoft's ProKey, there is an alternative that is even cheaper and much better.

The public domain program *Keyloc* not only gives the combination keys a toggle action but also provides beep tones that indicate the new state whenever one of those keys is operated.

Because of some changes in ROM code there are two versions of *Keyloc*. Both versions, in both .EXE and .ASM form, are on the current Silicon Valley Computer Society disk no. 43, along with a bunch of other neat stuff. Order from the Silicon Valley Computer Society, P.O. Box 60506, Sunnyvale, CA 94022—\$6.50 total.

Herb Shear
Los Altos, California

Letters

Jr Canine

This is in answer to your request for "initial reactions" to the PCjr.

I've been involved with computers for about 15 years. I can remember when the only trustworthy storage device was a punched card. Data written to tape was often not readable, especially if the tape was mounted on a drive different from the one on which it was written. The "mainframe" I used had a memory of 28K and was down 80 percent of the time. It was not an IBM machine. When I was introduced to an IBM 360 XXX, I could hardly believe what I found: it was up most of the time, and tapes could be read years later—even on different machines. I became convinced that IBM was truly a remarkable company; even more, it was a national asset, and I'm dead serious about that opinion. I like IBM products, and I think the company takes a lot more abuse in the media than it deserves.

However, companies do make mistakes, and I believe the PCjr is a mistake. I've seen it and read about it. Doug Clapp (*InfoWorld*, Vol. 6, Issues 2 and 3) described it well. An excerpt from his opinion: "It was too expensive. It couldn't be sold on the basis of features—it didn't have any . . . to say the jr even has a keyboard is far too charitable."

It bothered me to read the glowingly positive articles in *PC World* [Vol. 2, No. 2] about the PCjr. It certainly makes me suspicious about the objectivity of the editors of *PC World*.

The label on the PCjr should not be IBM; it should be D-O-G.

Gene Doremus

Houston, Texas

Disappointed by Gemini

I was delighted to see the letters in the February issue of *PC World* concerning the Gemini 10 printer [*Letters, PCW*, Vol. 2, No. 2]. I immediately wrote Mr. Fritsch of Star Micronics to obtain more information in response to his statement that "The other solutions to this slowdown involve a little more than plugging a box into the system. . . . I invite those readers who want more specific information to write or call us at Star Micronics National Service Headquarters." I indicated that I desired the information to which he made reference.

I received a prompt reply that in essence reiterated the information concerning the installation of a buffer. (If I had wanted to spend more money, I might have purchased a different printer.) I wrote again referring specifically to the sentences cited above and again requesting the information referred to. After nearly a month I received a telephone call from Star Micronics asking what information I really wanted. I again cited the statement contained in Mr. Fritsch's letter. Again I was told I could purchase a buffer. When I

pressed for more information, I was told they have no patches that will solve the situation, they will not upgrade my printer to one which will work without the slowdown, and there is sufficient information in the printer manual to enable me to write a patch to BIOS myself.

I feel that the support I have been offered is not consistent with the tone of the letter written by Mr. Fritsch. I sincerely hope Star Micronics will provide better service in the future and I wish them well, but in the meantime it appears I will have to put up with a product that is poorer than I believe they advertised.

*Robert L. Wilson, Sr.
Lexington, Virginia*

Super Support

In Katie Seger's article, "What Happens If It Breaks," [*PCW*, Vol. 2, No. 3] she labels the PCjr 12-month warranty program "a laudable precedent" when in fact it is not.

Digital Equipment Corporation (DEC) announced their 12-month, on-site warranty program for the Professional 300 series, the DECMate II, and the Rainbow 100 in October 1983. In addition, DEC offers toll-free telephone support during the warranty period.

*Theresa D. George
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Letters

Jr's Tutor

In "Charting the PCjr Software Course" [PCW, Vol. 2, No. 2], a common misconception was perpetuated. To correct it, let me assure your readers that *Private Tutor* does run on the PCjr.

Private Tutor is packaged with DOS 1.10 on the disk, and the differences in the disk drives on the PCjr are such that I/O errors can occur. Such errors are infrequent but may occur due to the PCjr's different I/O timing. The solution is to copy DOS 2.10 onto the *Private Tutor* disks. Operation is then normal.

I have been assured that the list of PCjr-compatible programs published by IBM has been altered to correct this error.

Thomas K. Brown
San Jose, California

Get Our ACT Together

The article reviewing the ACT Apricot ["The Compatibles Line Up," PCW, Vol. 2, No. 4] contains incorrect information.

The telephone number listed in the review is our fax machine number. The correct number is 408/727-8090. Also incorrect is the company name, "ACT Ltd." ACT Ltd. is located in the United Kingdom. ACT (North America) Inc. is a subsidiary of ACT.

Victoria Wyatt
ACT (North America) Inc.
Santa Clara, California

Back to the Bench

Your interesting article comparing three different FORTRAN compilers ["But Is It Really FORTRAN?" PCW, Vol. 2, No. 2] demonstrates the danger of careless benchmarks. The results suggest that the Microsoft version is about nine times faster than the IBM version. This is surprising since both compilers were written by Microsoft.

Unfortunately, the comparison was not made on an equal basis. The debug mode defaults to off for the Microsoft version and to on for the IBM version. The authors should have added the compiler directive \$NODEBUG to the first line of each IBM program. This dramatically speeds up execution. The resulting code is also much smaller.

Alan R. Miller
Socorro, New Mexico

Thank you for calling this error to our attention. Had the \$NODEBUG metacommand been included in the IBM code, the results of the execution speed tests for the IBM compiler would have been similar to those for the Microsoft compiler. However, this fact does not change the overall con-

clusions of the article. The IBM compiler still has no advantages over the Microsoft compiler. Microsoft FORTRAN has many language features that IBM FORTRAN does not have. It also provides a very well implemented 8087 library that greatly improves its floating point operation speed with the 8087 numeric coprocessor.—Charlie Huizenga and Chip Barnaby

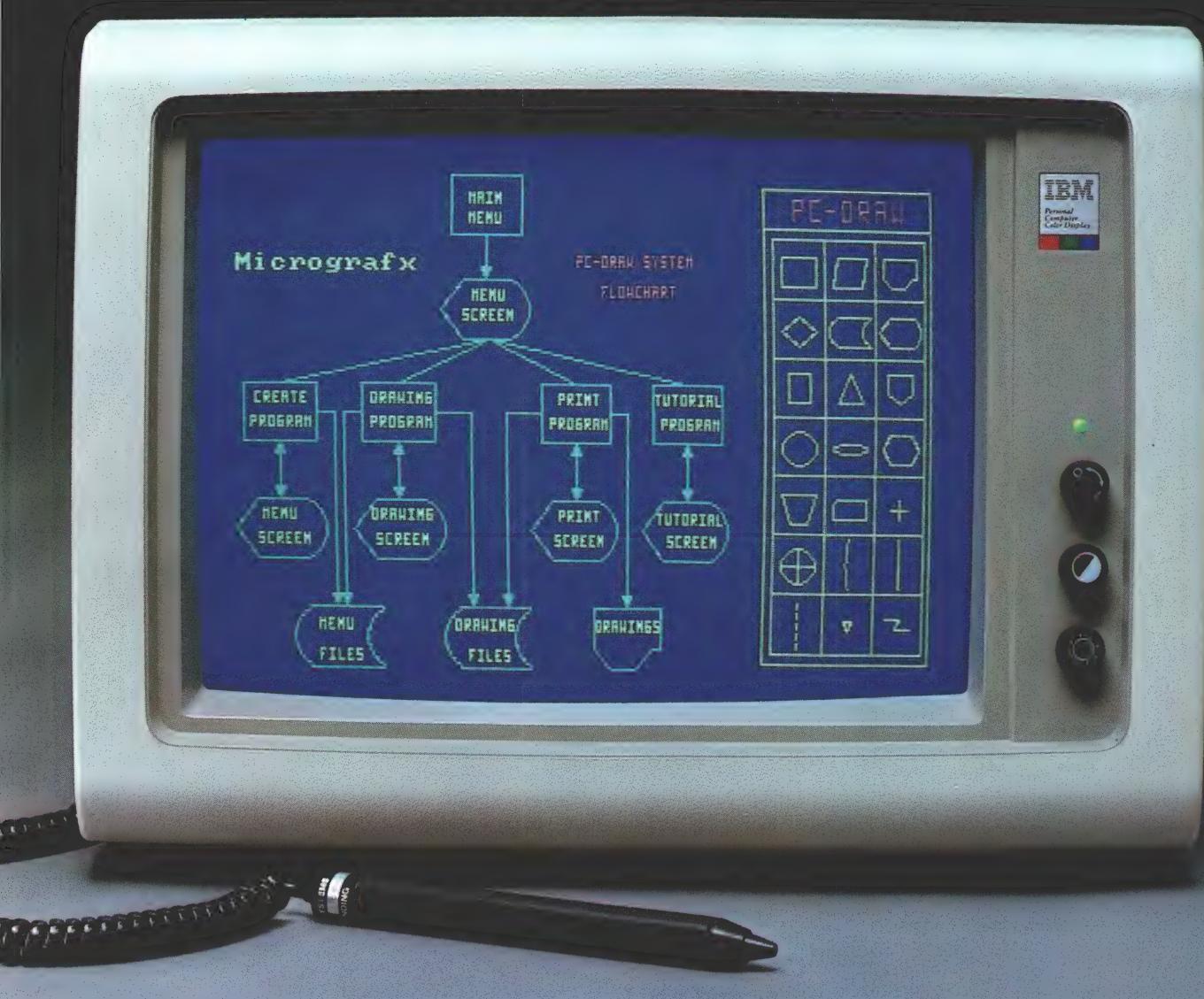
End of the Line

I thought I knew what an ASCII text file was, but your editor's note ["Getting the Word," PCW, Vol. 2, No. 4] threw me. Every text editor I have ever used ends each line with an invisible end-of-line marker. The marker usually consists of a carriage return (ASCII 10) and a linefeed (ASCII 13). Yet you state that you accept articles for publication that use ASCII characters 32 through 127 only. How can this be?

Bill Kraengel, Jr.
Valley Stream, New York

It can't; you're right.—Ed.

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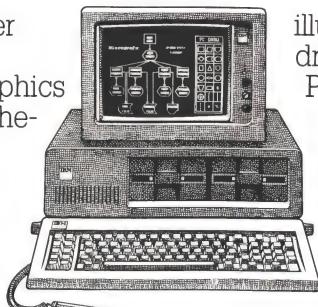
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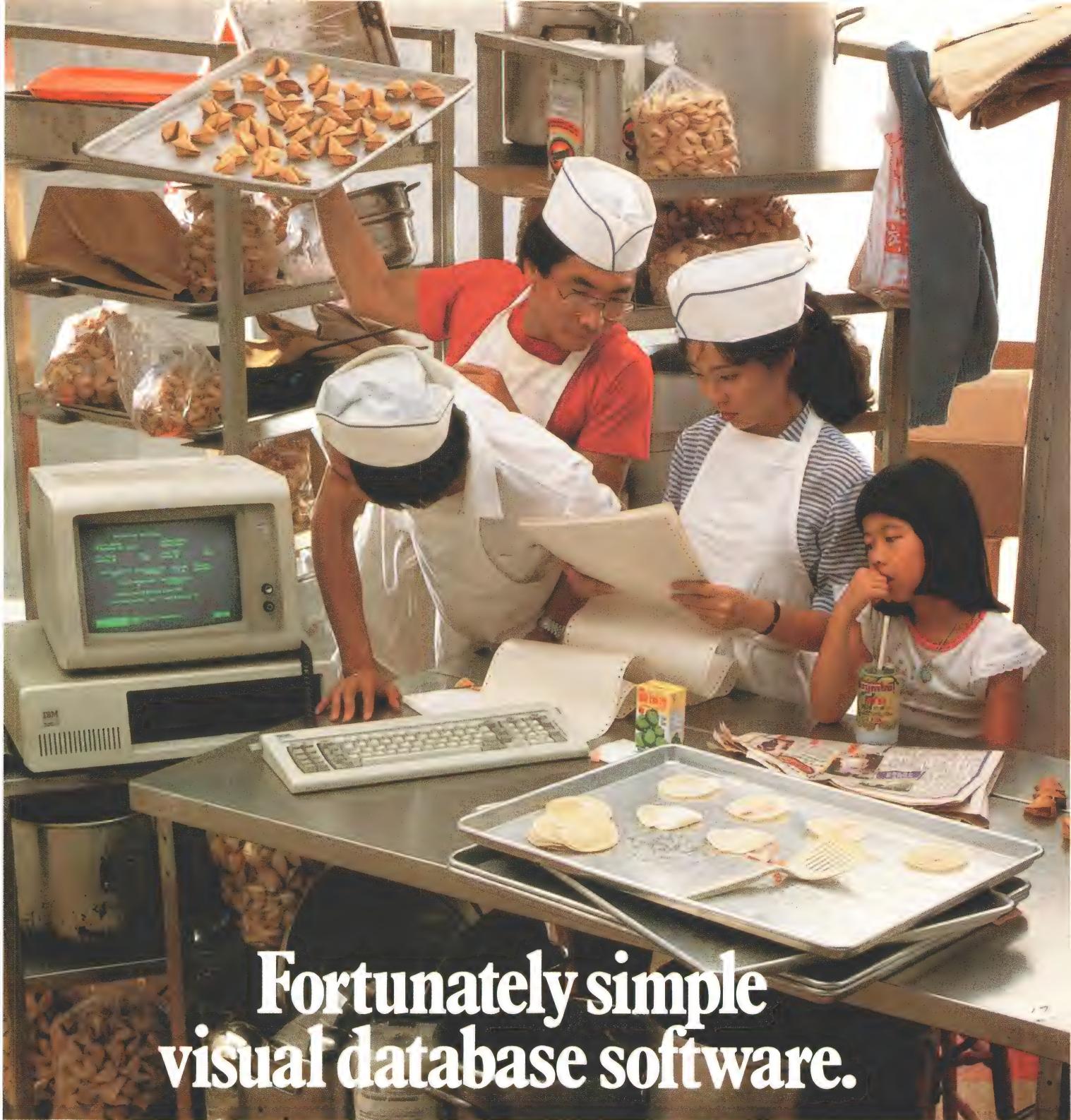
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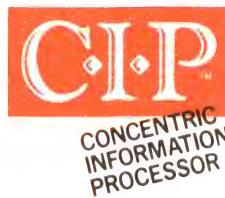
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PC WORLD

Grapevine

Rumors, Tidbits, Speculation

—————

Big Blue Bubbles

Is IBM coming out with a lap-size PC? An industry source says that IBM has a contract with Hi-Comp, a bubble memory board maker in Redmond, Washington. According to the source, Hi-Comp has been designing a 256K bubble memory board for Big Blue for some time. The contract could mean that IBM plans to offer a full-size bubble memory expansion board for the PC and the XT; however, a number of companies, Hi-Comp included, already produce bubble boards for the PC. It's more likely that IBM plans to incorporate the new board in a yet-to-be-announced computer.

Bubble memory is stored on chips made of garnet instead of silicon, and it is nonvolatile, so data is not lost when the power is turned off. Its nonvolatility and durability make



bubble memory an important component in small computers such as the sleek GRiD Compass and the Teleram 3000. Could the boards be headed for a briefcase-size computer—code-named the Crackerjack? We'll just have to wait and see.

—————

Too Much of a Good Thing

An anonymous correspondent tells us that IBM may have gotten more hands-on testing than it bargained for a few months back. According to our reporter, IBM recruited a group of local residents who had no prior computer experience to test the PCjr before its release. One diligent tester followed the instructions in his manual quite literally: they said to remove the disk from its protective sleeve, so he did. He held the flimsy round piece of plastic gingerly, think-

ing he'd done the right thing until he came to the next step in the instructions. It told him to grasp the disk by its top two corners and slide it into the drive. Of course this man's disk didn't have any corners. We haven't heard whether he got the floppy into the drive, but this tough consumer test may have resulted in a new picture in the PCjr's manual.

—————

Disk Drive Doings

The rumors continue to fly regarding IBM's handling of contracts for supplies of hard disk drives. Although the hard-disk-equipped XT is selling well, IBM abruptly diminished its orders for 10MB hard disks from three firms—Seagate, MiniScribe, and International Memories. One source reports that IBM will continue to purchase the drives from Seagate but will not renew its contracts with MiniScribe and International Memories. The slack will reportedly be taken up by two branches of IBM—IBM Japan and IBM's manufacturing unit in Rochester, Minnesota.

Another industry source speculates that IBM will use 3½-inch disk drives in one or more of its computers this year. In addition to ordering large quantities of microfloppy drives (like those used in Hewlett-Packard's HP 150 and Apple's Macintosh and Lisa), IBM is expected to offer at least one product with a built-in 3½-inch hard disk. Could the next generation of notebook computers be on the way?

PC World View reports new developments in computer technology, items of interest to all computer enthusiasts, and the most significant and enticing speculation about industry trends and personalities. We've reserved the "Grapevine" section of this column for industry reports that are still at the speculative stage.

—*Miriam Medom and Katie Seger*

View

News and notes for the computing community

You're Gonna Like Us!

Correspondent Karen Dowell investigated a new on-line travel service and files this report:

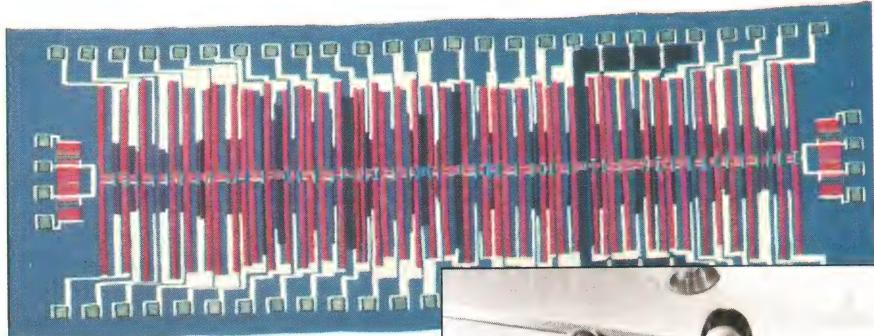
For people frustrated with travel agencies or calling an infinite number of airlines to find the right plane at the right price, there may be a light at the end of the runway. A recent agreement between CompuServe and Trans World Airlines will bring the schedules and fares straight to your PC.

The menu-driven system is slated to begin operation by October 1. The service will enable CompuServe subscribers to review flight availability, make reservations, and even buy tickets with major credit cards. The tickets will then be mailed, issued through a travel agent, or held at the airline's ticket desk for the customer.

According to Mary Vaughn, marketing manager of travel products for CompuServe, the service fills a gap in the travel communications industry by eliminating the time spent with an intermediary. Although fees have not yet been determined, Vaughn estimates that the service will cost \$20 to \$40 per hour.

"The on-line reservation system marks the direction personal computers will take in the future," according to Peter T. McHugh, a TWA vice president. "This is a significant step in extending the benefits of this advanced technology to the consumer," he states, "and we expect that we will soon have agreements with other information services."

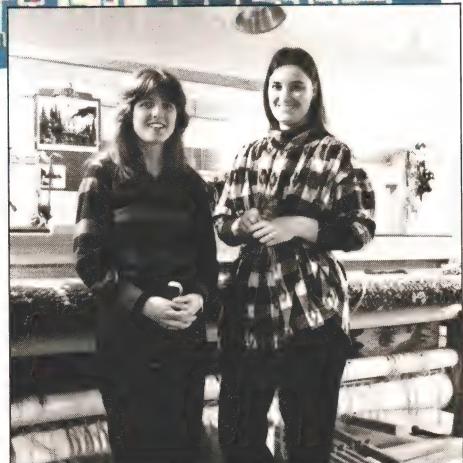
What a Tangled Chip She Weaves



Art and technology have achieved a beautiful marriage in the microchip tapestry that graces the Honeywell headquarters.

Combining VLSI and ALU with weft and woof was easy for weaver Janet Kennedy. Kennedy's tapestry, "Circuitry," is an artistic rendition of a Honeywell thin film resistor array. The 9-foot by 3-foot tapestry (see photos) hangs in Honeywell's corporate headquarters in Minneapolis, Minnesota.

"My training is in large-scale realistic representations, but usually I do landscapes," said Kennedy, who has been a professional weaver for 10 years. She was enthusiastic about her first technology-inspired project, however. "Honeywell sent a whole stack of chips to me. Then the project manager, the interior decorator, and I got together to choose the right chip and a color scheme," she said.



Weaver Janet Kennedy (left) in her studio with assistant Isult Caulfield

Kennedy and her two assistants sidestepped traditional weaving procedures by working from an enlarged color photograph of the chip instead of a preparatory design, or cartoon, of the planned tapestry. The wool, cotton, and linen wall hanging was finished in eight weeks.



Good Pitch—A 99-Cent Demo on Disk

PC World was the first publication to bind in a demo disk—Microsoft Word—but now Main Street Software has introduced an almost-free version of its data management program.

Main Street Software of Sausalito, California, has instituted a rather nifty promotion for its *Main Street Filer*, a filing program that also prints reports and several styles of name-and-address listings. Computer dealers who carry the Main Street program can get a free box of demo disks and sell them to customers for 99 cents each. The demo disk contains a full implementation of *Main*

Street Filer, but it allows only five records to be created and saved or printed.

The demo disk is packaged in an attractive printed plastic envelope, which contains the disk and a 20-page, disk-size booklet called the *Short Course for Main Street Filer*. This mini-manual introduces a few basic concepts of data management and then takes the reader through all phases of the program. The disk is an inexpensive sales tool that seems ideal for both dealer and customer: the customer gets a reusable disk for one dollar, the dealer avoids a time-consuming sales pitch to demonstrate the program, and (in theory, anyway) at least some people who try the demo will purchase the program.

If you can't find a dealer who has the demo disk, contact Main Street Software, One Harbor Dr. #304, Sausalito, CA 94965, 800/824-8757, 415/332-1274.

Little ROMance for PCjr

Following the introduction of the PCjr, several industry writers suggested that software manufacturers would put best-selling programs on ROM cartridges. Such ROM-based software wouldn't take up any of the computer's limited 128K RAM or floppy disk storage. But so far the PCjr hasn't sold very well, and most software firms are waiting to see if the sales pick up before they commit to such a software conversion.

One exception is Lifetree Software, which brought out a cartridge version of *Volkswriter Executive* this summer. According to Lifetree president Camilo Wilson, his company spent \$30,000 on research and development of the product, but he stressed that "we didn't put all our eggs in the PCjr basket." While acknowledging the cautious attitude of his software rivals, Wilson doesn't think Lifetree took a gamble. "The PCjr has some problems—the keyboard for example—but we know who stands behind the computer. IBM won't take a bath with the machine. IBM will make the changes it has to make," he said.

Wilson's optimism notwithstanding, PCjr sales have not been brisk. In fact, some dealers are giving the term "bundling" a new meaning by throwing in a free PCjr with every XT sold.

Big Blue's News

* ————— *

Garbage Out, Garbage Out

The Entry Systems Division of IBM, which operates the main assembly plant for the PC and the XT, has found a solution for a manufacturing problem that most people don't think about much—trash. As part of its overall drive for efficiency in order to meet the booming demand for PCs, IBM has accelerated production of the computer to one machine every 16 seconds, and that rate will increase to one every 7 seconds by year's end. But what about the boxes and plastic wrappers that protect all the parts going into a PC?



At the increased rates of production, workers would be knee-deep in debris if they had no place to send the garbage. So IBM designed a trash collector that is installed above the production line. Workers throw trash into the device, which is essentially a long basket on a conveyor belt. The basket whisks the wrappings away and the worker is presented with an empty section of the basket by the time he or she has liberated more litter.

* ————— *

The Brit-Mail Contract

IBM's British telecommunications unit has scored a nice coup—selling its 1750 series of electronic exchanges to the British Postal Service. The precise value of the contract wasn't disclosed (the British are almost as reluctant to talk about money dealings as IBM), but this is known to be a multimillion-dollar deal.

In Britain the post office also provides phone service, and the 27 IBM exchanges will transmit both voice and data to some 130 regional post offices. One component of the new service will be a facsimile-transmission service, rather like a high-quality, long-distance copier.

The 1750 series of exchanges is marketed only in Britain and Europe. The British post office chose the IBM equipment over competing hardware offered by General Electric, Harris Corporation, and other major telecommunications suppliers.

Building a Better Chip



Potatoes seem to figure prominently in *PC World View* lately. We recently reported that the Washington State Potato Board was none too happy about Microsoft's "junk food" ad showing a bag of french fries. Now we've heard from correspondent Rollin Moseley that one kind of chip is designing another kind of chip. Rollin's report follows:

Always in search of a better potato chip, Frito-Lay, maker of Ruffles, turned to computers to design a new super dip chip. In pursuit of this goal, Frito-Lay has introduced O'Grady's chips, which have ridges that are proportioned mathematically to give optimum crunch and flavor without bulk.

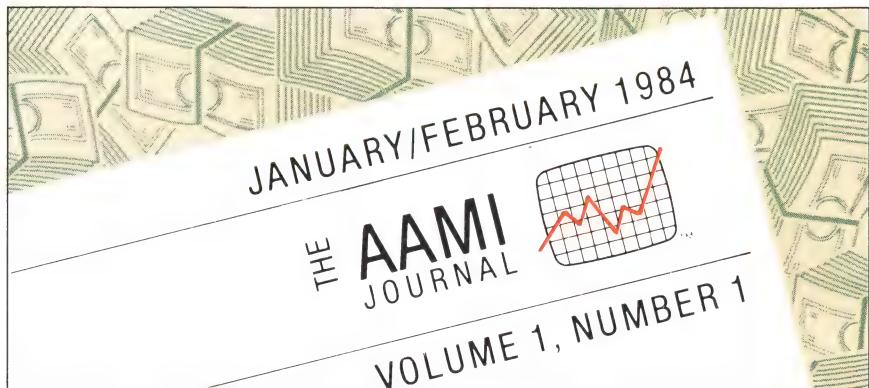
On other potato chips, the ridges on the top and bottom are synchronized. On the chips that microchips built, the bottom ridges are

Investment Update

* ----- *

On-Line Advisor

On-line investing continues to fascinate microcomputer owners, and now there's a group that offers advice, software reviews, and discounts on programs for electronic traders. The American Association of Microcomputer Investors publishes a bi-monthly magazine, *The AAMI Journal*, which offers free investment-related software to members and maintains a directory of commercial programs related to investing. Annual membership is \$49; a sample is-



sue of the journal is available for \$3. For more information contact Thomas Meyers, AAMI, P.O. Box 1384, Princeton, NJ 08542, 609/921-6494.

* ----- *

Bankers' Best Buys

Instinet is a stock-trading system that has specialized in serving institutions such as banks and insurance companies. Recently, however, Merrill Lynch bought a small chunk of Instinet (about 8 percent), and the brokerage firm plans to offer Instinet to its brokers and customers next year. (The Instinet software and service will be integrated into the network of PC-based work stations that Merrill Lynch is currently developing in partnership with IBM.)

The reason that Instinet has suddenly become hot property is its unique trading system. The service offers 3500 stocks listed on the major exchanges or available over the counter. Traders can order up to 1000 shares of any stock, and Instinet will rapidly poll its data base

and locate the best price for that stock. Then it will put the transaction on hold for 30 seconds, while still checking its listings in case a better price is offered during that interval. If not, the purchase is made.

Not only does Instinet take advantage of the computer's data-crunching abilities to find the lowest price, but it also has a built-in form of democracy. If more than one trader is offering the lowest price for a stock, the Instinet software automatically rotates orders among the traders selling at that price.

PC World View welcomes contributions from readers, and we'll pay up to \$50 for the items we use. Please include your name, address, and phone number with your contributions; send them to PC World View, PC World, 555 De Haro St., San Francisco, CA 94107. ☎

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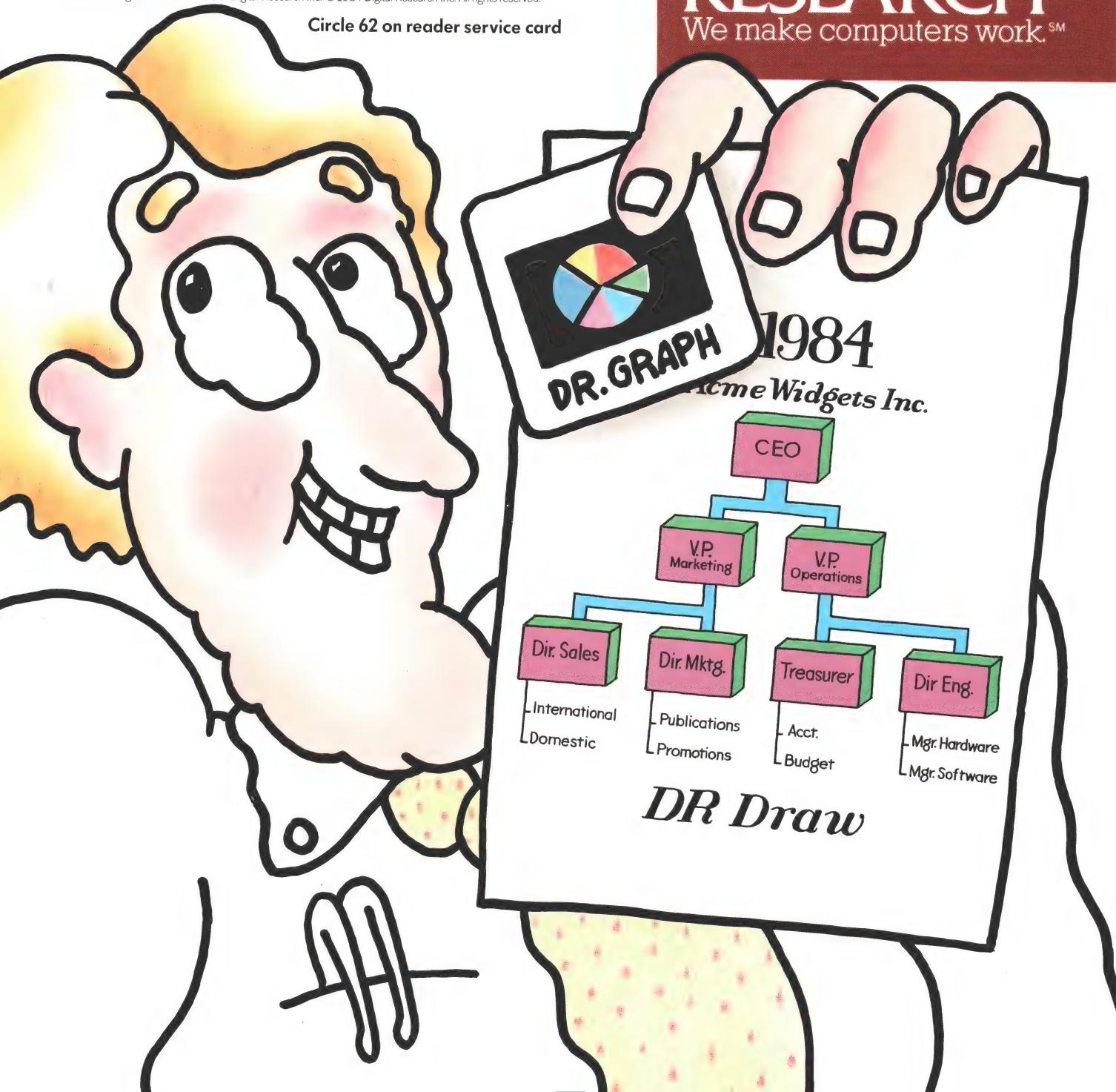
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Inside



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In The Beginning

In September of 1983 we introduced the first 212A

modem card for the IBM PC available for under \$300. The PC212A/1200 is a complete communications package including PC-TALK III software, modular phone cable, card edge guide, and instruction manual. The modem is an auto-dial, auto-answer type, which uses all the Hayes software commands so it can be used with any of the popular software packages including Crosstalk™ and Smartcom™.

We picked the best software package we could find based on its ease of use and features, PC-TALK III. Our modem includes features the old industry standard missed out on. Like being able to fit in one slot in a Portable PC or PC/XT. Or an optional connector to use the modem's serial port when not using the modem. Of course the topper is the \$299 price, hundreds less than the competition.

PC212A/1200 Includes: Modem Card, PC-TALK III software, card edge guide, modular phone cable, quick reference card, and instruction manual. **\$299**
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Our standalone modem, the 212E/1200 can be used with any computer or terminal with a RS-232C serial port. You can use any Hayes compatible communications software on anything from an Apple to a Zenith. Many owners of IBM PC's are using it because they lack available expansion slots, or have more than one computer they want to use their modem with.

It's attractive gold anodized case houses seven status lights (who says low prices means a shortage of features). It fits comfortably under a standard telephone. It is also a 212A compatible auto-dial, auto-answer modem which supports all Hayes software commands. Even the switch settings are the same, so any software giving recommended switch settings for a Hayes modem can be used, without knowing

Outside

out the Qubie' 212A modems.

212E/1200 Includes: Standalone modem with cable (specify male or female), modular phone cable, and instruction manual. \$329.



what the switches do. There is a volume control knob for easy adjustment of the speaker's output. Included in the package is modular phone cable, a cable to hook it to your computer or terminal, and instruction manual. Choose the communications package right for your needs, and you're ready to go!

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The heart of the Qubie' modems are four digital signal microprocessors. Two handle sending, and two do the receiving. Rather than attempt to filter all but the relevant tones used for modem communications, the microprocessors measure the tones digitally. This allows them to overcome line noise and static better than analog filter based modems.

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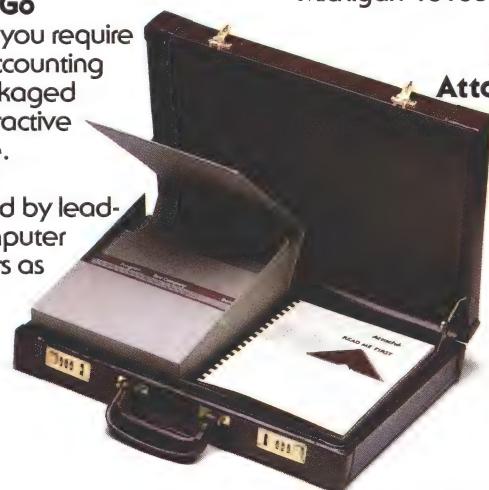
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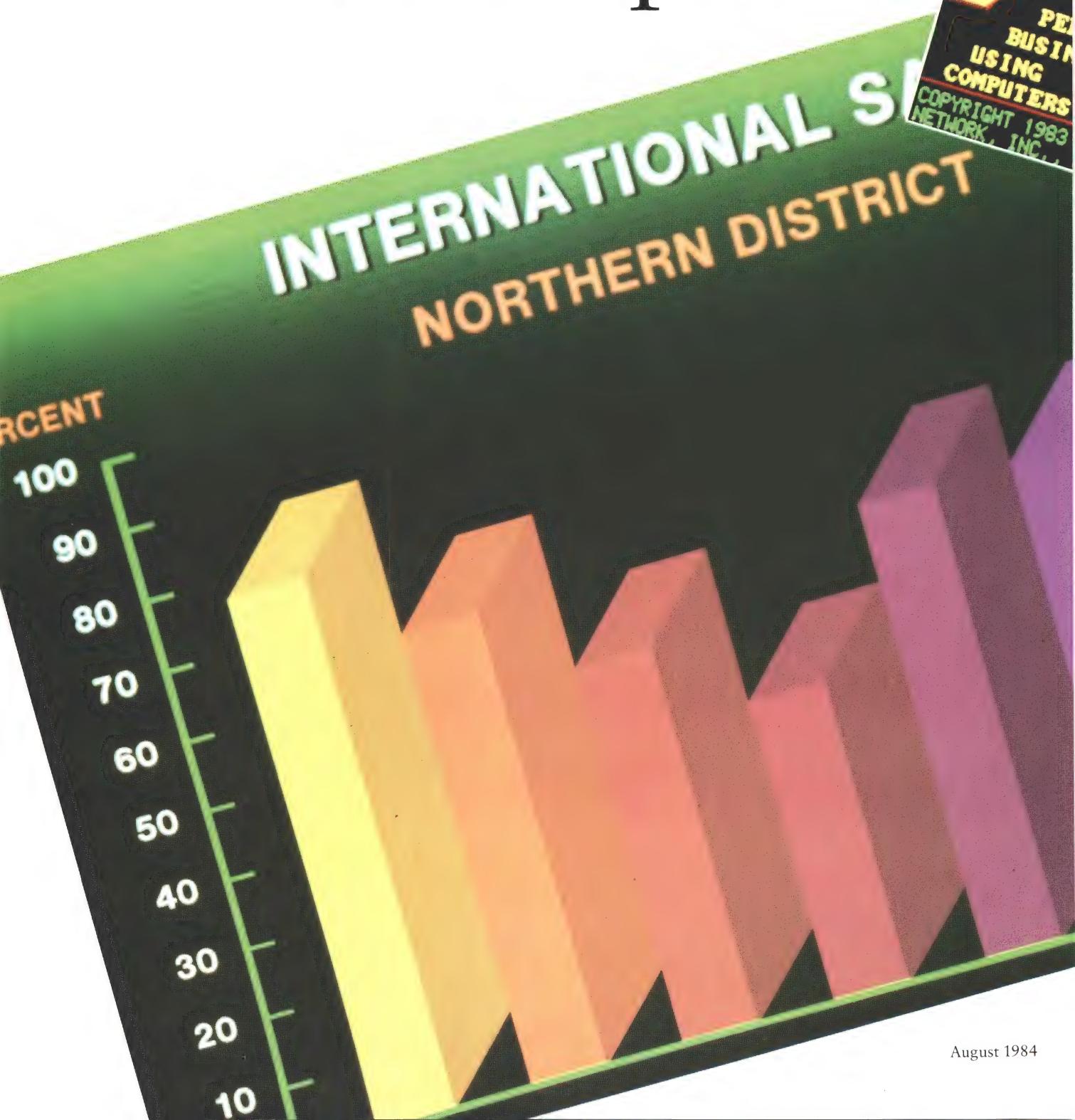
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The Boom in Business Graphics





From left to right: Graphics created with the Genographics Series 1000 by Genographics Corporation, VCN ExecuVision by Prentice-Hall, and the VideoShow System by General Parametrics Corporation

David L. Wilcox

"Let us in no way minimize the opportunity, or the danger, involved. The 30 minutes an executive spends on his feet formally presenting his latest project to corporate superiors are simply and absolutely the most important 30 minutes of that or any other managerial season."

—Walter Kiechel III, Fortune magazine

The importance of those 30 minutes led to the production of more than 557 million business presentation slides in 1983, an increase from 263 million in 1978. In 1983 computers generated 16 million of those slides, up from only 300,000 in 1978 (Hope Reports, Inc., Rochester, New York). The pattern is clear: businesspeople are discovering that graphics are a quick and efficient way to communicate. Although the written word is often the only effective way to relate complex information, reading or listening to words is a slow process. The average person can speak only 110 to 120 words per minute, yet the mind is capable of understanding many times that number. What's more, the mind retains a visual representation of data with greater accuracy and for a longer period of time than it does a written equivalent.

With reams of computer printouts full of data to present, today's business professional is crippled without the use of conceptual shortcuts. Try an experiment on yourself. Read the paragraph in Figure 1. How long does it take for you to comprehend the significance of the data? Now look at Figure 2, a graphic representation of the same data; instantly the trend is clear.

Despite the number of professionals who would benefit from computer graphics, many find the area confusing, riddled as it is with jargon like *resolution*, *pixels*, and *raster scan*. For someone who needs to evaluate microcomputer-based graphics for his or her organization, the best approach is to read the literature and learn the jargon. However, the technology barrier can be sidestepped by finding the answers to some basic questions.

Compuco's After Tax Operating Income was between \$235 and \$300 million in the first 2 quarters of 1981 prior to the acquisition of Flodata. Since then quarterly income from Compuco's traditional business has declined steadily to a level just over \$100 million in the 3rd quarter of 1982. With quarterly income ranging between \$140 and \$240 million, Flodata has more than doubled Compuco's After Tax Operating Income during the first three quarters of 1982.

Figure 1: Text chart. Compare the time it takes to read and understand this paragraph with the time it takes to comprehend the message in Figure 2.

Why Use Graphics?

Computer graphics can be used in a variety of ways, including for artistic expression and CAD/CAM (computer-aided design and computer-aided manufacturing). However, the dominant use of computer graphics is to represent data in a readily understandable, visual format. Data representation can be used for a wide spectrum of applications. For example, stock analysts and brokers could view stock price and volume charts on a real-time basis from a central data base, or a soft drink company might want to present sales and advertising plans for a new soda to its bottlers (see Figure 3).

Today's business professional is crippled without the use of conceptual shortcuts.

The verbs used in these two examples—*view* in the first and *present* in the second—are indicative of two fundamentally different requirements for data representation. In the case of the brokerage house the objective is to use computer graphics as a window into large volumes of data, as an aid to the viewer in extracting information. Due to the widespread use of spreadsheets and data base management applications, this type of analytical graphics is generally the most prevalent graphics application for PC users.

The soft drink company, on the other hand, is using presentation graphics to communicate a series of messages to an audience. Although often classified together, analytical graphics and presentation graphics place different demands on a graphics system. Understanding those demands and the extent to which PCs in your organization will be used to do each type of application is a good starting point for evaluating graphics hardware and software.

What Graphics Are Needed?

Since the news media has long recognized the value of business graphics, most of us are familiar with bar charts, pie charts, and line charts, yet we may not know the best one to use in a particular instance. These chart types can be linked directly to a spreadsheet, a data base management system (DBMS), or an integrated package such as 1-2-3. These three types compose a core group of graphs that will suffice for most analysis applications. The wave of integration currently sweeping the software business will result in the addition of basic analysis graphics to most spreadsheet and DBMS packages.

In contrast, business graphics prepared for presentation use a wider range of graph types. Figure 4 identifies the chart types most commonly used in a presentation environment. The two most frequently used chart types—line and vertical bar graphs—are predominantly

THE FLODATA ACQUISITION RESCUED COMPUCO PROFITS

After Tax Operating Income in Millions

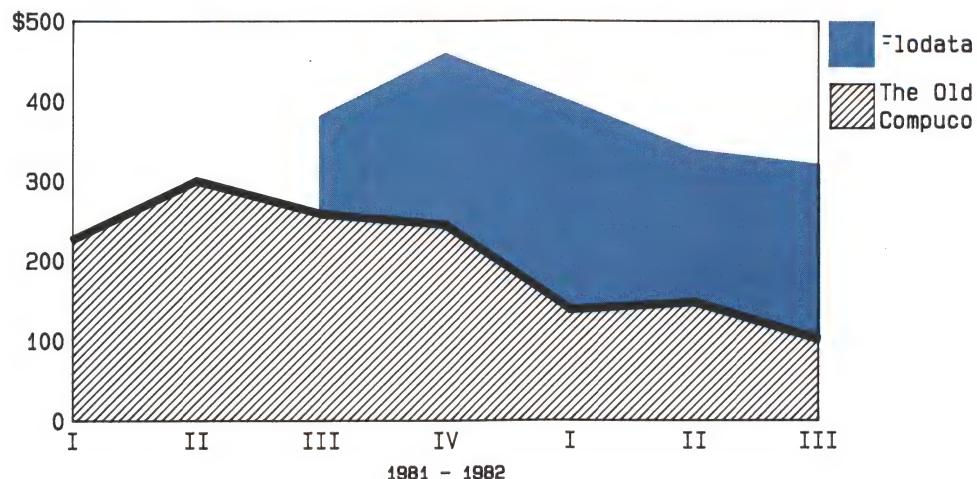


Figure 2: Multiple area graph. The message is the same as in Figure 1, but the trend can be comprehended in a fraction of the time.

Advertising and Promotion Schedule

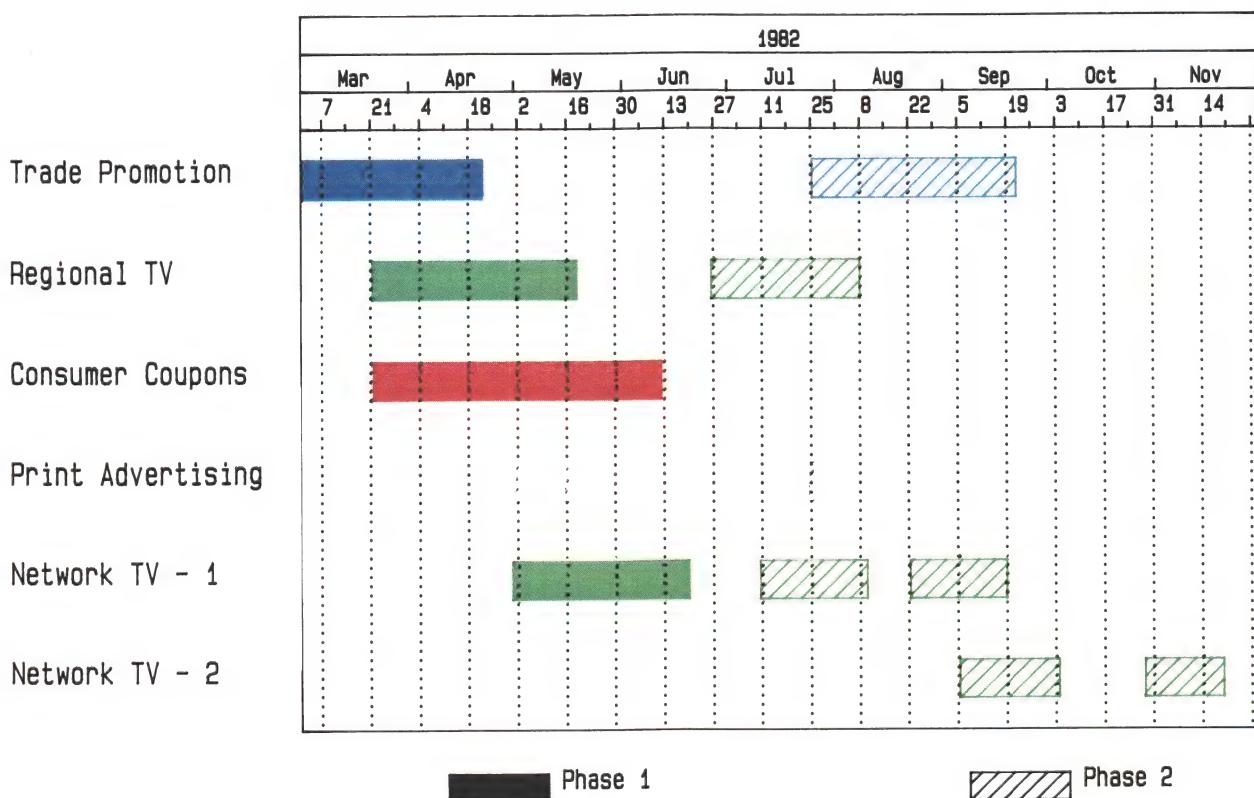


Figure 3: Gantt chart. Gantt charts are used for scheduling multiple activities over time.

● Getting Started

Created using Graphwriter. Source: Frost and Sullivan, Inc.

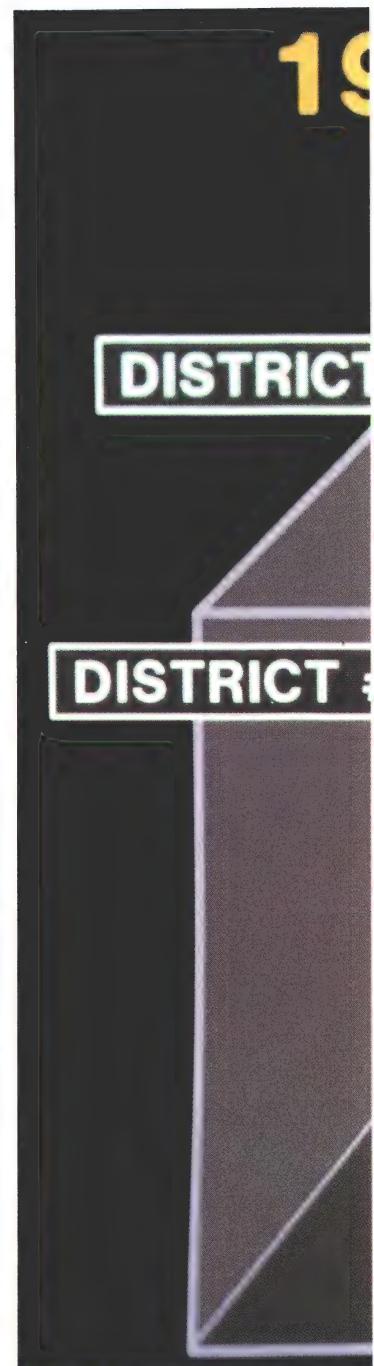
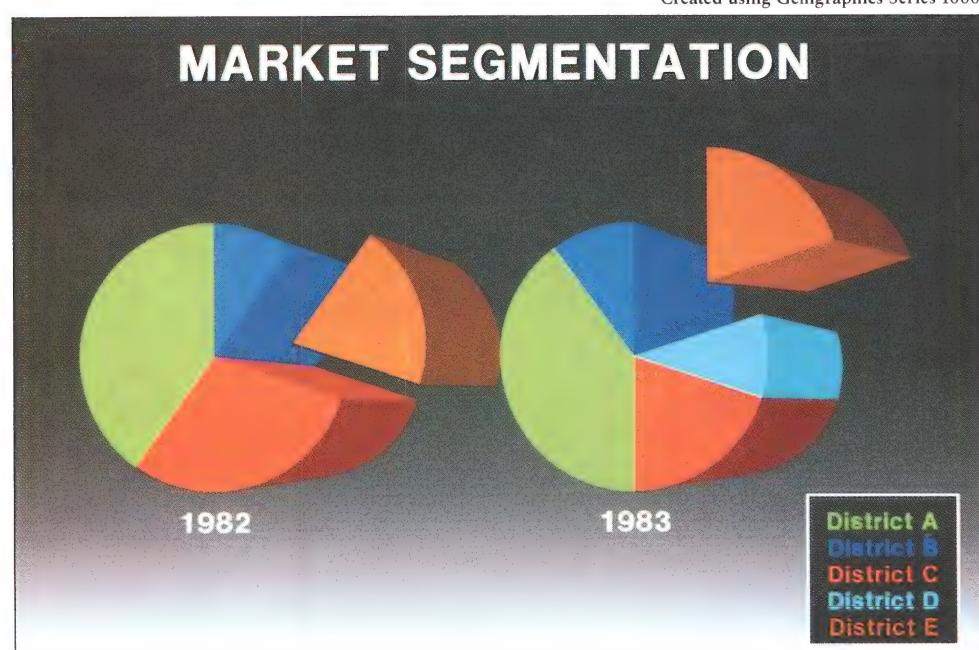
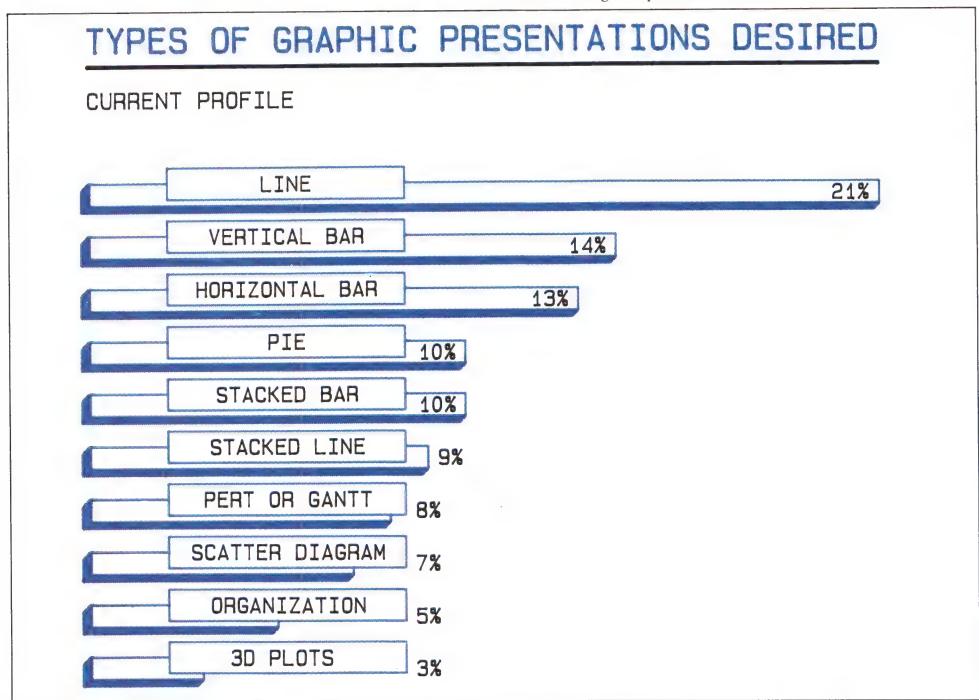


Figure 4 (top left): Horizontal bar chart. Line, bar, and pie charts make up the majority of graph types used in presentations.

Figure 5 (right): Three-dimensional bar chart. 3D can add impact to a simple bar chart.

Figure 6 (bottom left): Multiple exploded pies. Dissecting and exploding pieces of the pie concentrates the viewer's attention on the point you want to make.

used to show data over time. Non-time-oriented presentations (such as Figure 4) most frequently employ horizontal bars. Some graphics programs allow you to present bar charts in a three-dimensional format (see Figure 5).

While a single pie chart may be adequate for analysis, presentation of that analysis often requires multiple pies with proportional sizing, slices that are highlighted or "exploded," and the ability to rotate to a desired position (see Figure 6). These customizing features are the domain of presentation, not analysis, graphics software.

83 QUARTERLY PROFITS



Note that several nonanalytical formats, such as organization charts and Gantt scheduling charts (for example, the chart in Figure 3) appear lower on the list in Figure 4. Although they are not as commonly used as other formats, they are unique and have no substitute. Many presentations cannot be prepared without them. Figure 4 does not include the most frequently used format—the text or word chart.

The intensive use of text in presentations is a factor often overlooked in selecting a computer graphics system for presentations. Many presentations would also benefit from the use of a freehand drawing capability. Although this area is not easily converted to a computerized application, the freehand graphics capabilities in the Apple Lisa and Macintosh are indicative of the types of programs that will be added to presentation graphics products in the future.

Most Managers Do Not Prepare Their Presentations Instead They Are Prepared By Support Staff

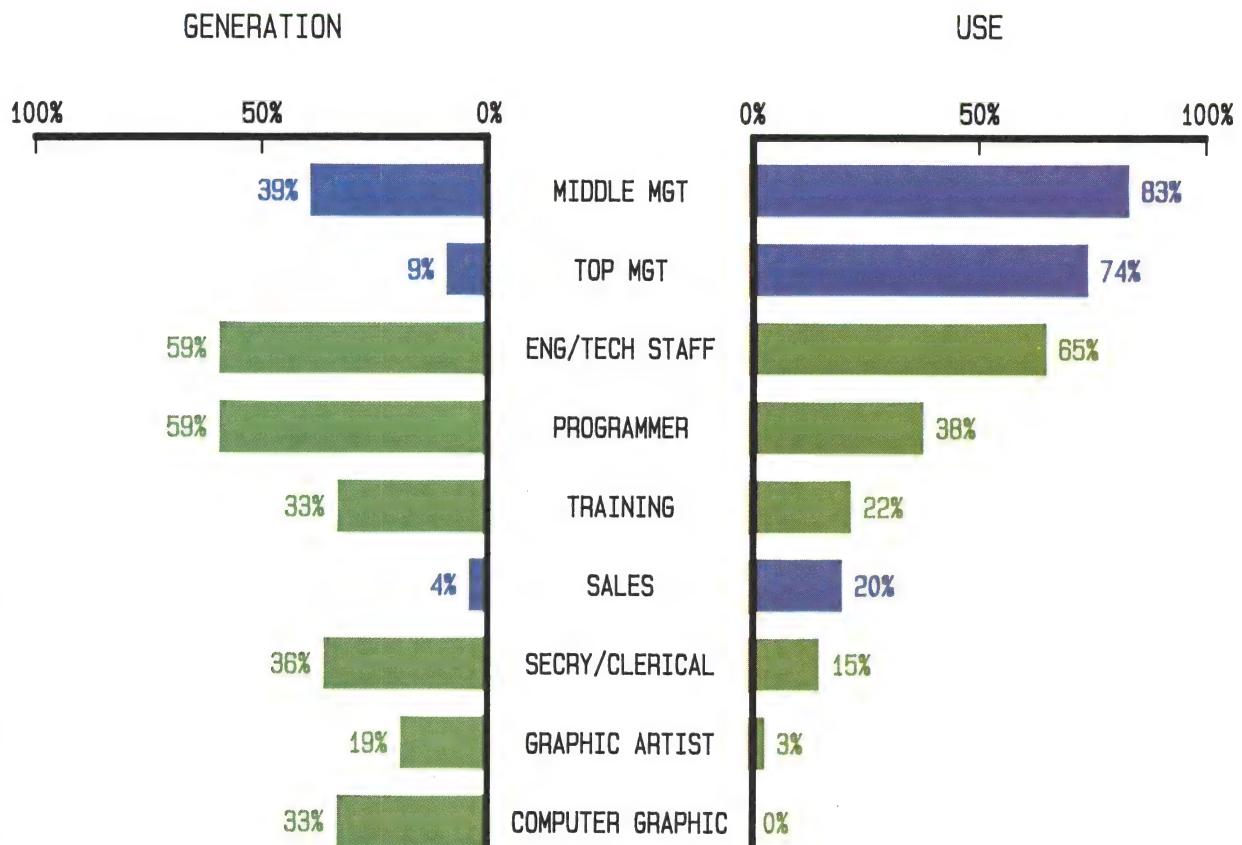


Figure 7: Double horizontal bar charts. Consider who will be creating and viewing computer graphics.

How Do I Select a Graphics Package?

Defining the audience for your graphics is probably the most important step in deciding which system to choose and how much money you should spend. Failure to address this question thoroughly can invalidate your investment. First decide whether you need analysis graphics, presentation graphics, or both. Then identify those systems that offer the necessary charting and text capabilities.

You should also consider who will be using the system. If you only have yourself to consider, the process is easy—buy what you want. However, in the typical office presentations are prepared by a subordinate for review

by the author and his or her peers and superiors (see Figure 7). If there will be more than one user, you should show samples from various graphics systems to key users. Even if you make the final purchasing decision alone, employees and co-workers can offer valuable input and point out problems you might have missed. Show screen displays and hard copy output to the team that will use analysis graphics and show hard copy and color slides to those who frequently give presentations.

In addition to securing the endorsements of users, make sure the packages you are evaluating offer the necessary output options. Output options include slides, transparencies, paper (hard copy), horizontal and vertical plots, oversize output, multiple charts per page, integrated text and graphics, and color. Most systems do some of those better than others and some not at all, so a list of priorities is helpful.

To encourage everyone in your organization to use a graphics program, you will probably want to buy software with a menu-driven approach and on-screen help. Typing a letter should not require the use of a manual, and the same should be true of creating a simple graph. A couple of products on the market provide fill-in-the-blanks input forms that can be used to guide an operator through the production of a chart.

Editing, storing, and retrieving charts should be simple, and the program should be flexible. You should be able to move quickly to any graphic or text element and make changes. If all data entry must be completed before a change can be made, the time needed for corrections increases dramatically, and so does the probability of error.

One irritating problem with most graphics software is the limited number of characters allowed for text and legends. The presenter should not be forced to use abbreviations that need to be explained verbally. Each chart should include sufficient information to stand on its own.

While refining or updating a graph, you will frequently need to make changes in the size, color, and location of the text. While analytical systems typically offer little or no flexibility in these respects, these customization features are becoming more common on presentation systems. The most sophisticated systems on the market today can adjust the layout of the text and the graph areas automatically. The ability to preview the graph on screen is another important feature, and the ability to produce a fast hard copy proof is useful, especially if an author is not producing his or her own charts.

Documentation for a graphics package should include a catalog of available charts. System capabilities should be communicated by pictures, not prose. If your graphics package does not include a chart book, make one and give copies to every presenter. All the system's users should understand what the system can and cannot do before a presentation is prepared.

Where Will the Data Come From?

For analytical graphics the ability to import data is key. Select an integrated program or one that can accept data from the spreadsheet or data base that you are currently using. However, for presentation graphics, which frequently integrate data residing in different data bases and noncomputer sources, quality and capability generally outweigh data compatibility considerations. Presentation graphics usually incorporate less data and more text than graphics used for analysis. It is usually faster to type in additional text than to search through and import parts of an external data base.

Nonetheless, the ability to import data from frequently used data bases is an important consideration, especially if you plan to use the same program for analysis and presentation. If the program supports the popular .DIF file format, it can be used with a number of programs, including *VisiCalc* and *1-2-3*. Some programs can also read popular mainframe formats such as FORTRAN flat files. In the near future, multiple-window operating environments, which enable powerful stand-alone programs to interact with each other, may be the best solution for developing presentation graphics.

The Demonstration

Once you have answered the basic questions outlined above, you should be able to narrow your choices down to a few graphics packages that suit your needs. At that point nothing substitutes for a hands-on demonstration of the packages you are considering. Some salespeople will want to give you a "canned" demonstration of the system. Also insist that you get a chance to sit down

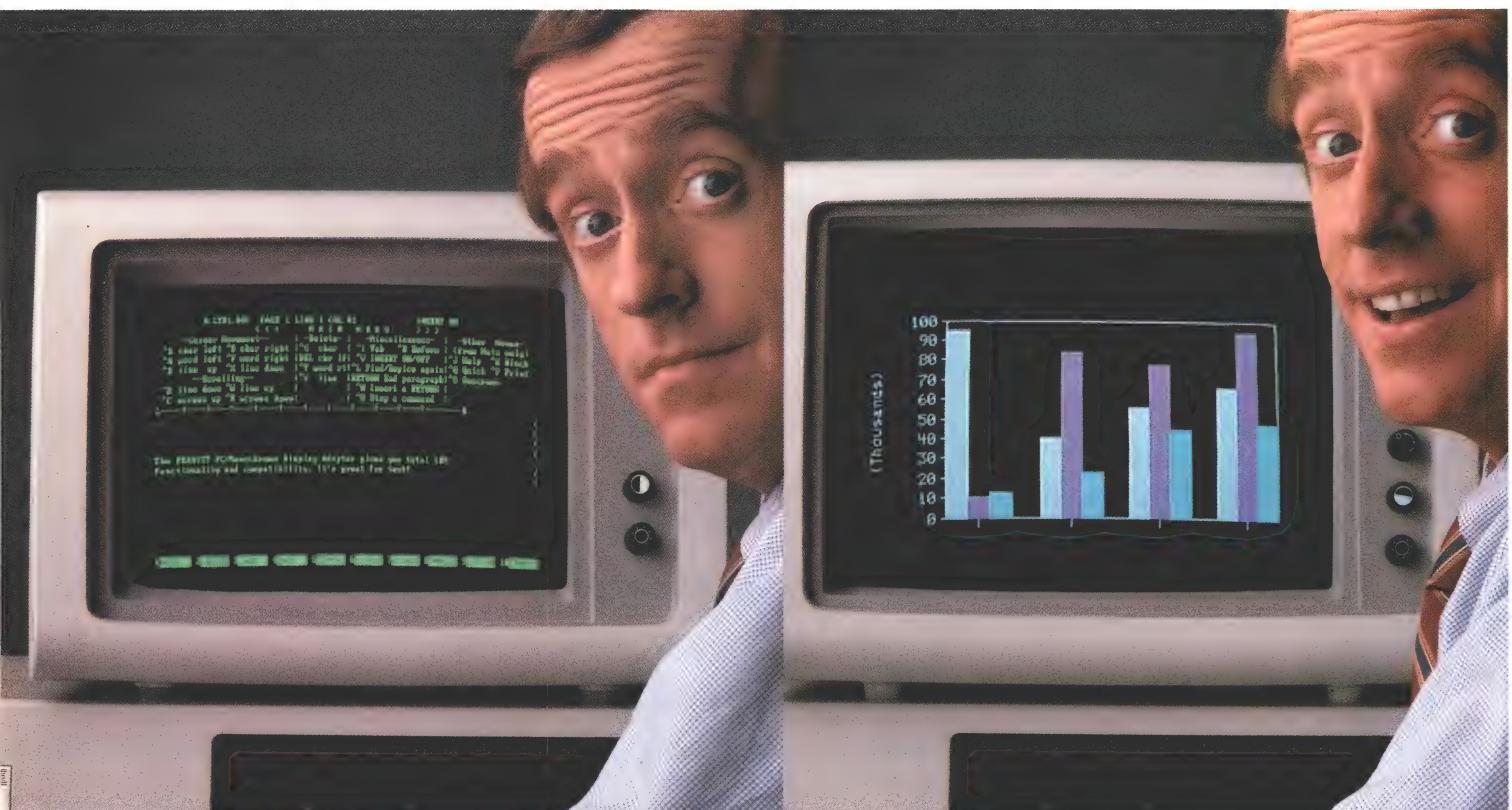
Each chart should include
sufficient information to stand on
its own.

yourself and actually produce a chart. Have samples of some commonly used charts available so you can reproduce them using the system. Critical shortcomings and potential problems that may have been overlooked will quickly surface. Make sure the hardware and software configuration you are testing is comparable to the one you have budgeted for; high-priced hardware can make a difference.

High-quality graphics software and peripherals can show results the first day. By carefully selecting a package that addresses your requirements, you can ensure that when it's time for your 30-minute presentation, your software won't add to the stage fright, but reduce it. ●

David L. Wilcox is vice president of sales at Graphic Communications, Inc., in Waltham, Massachusetts.

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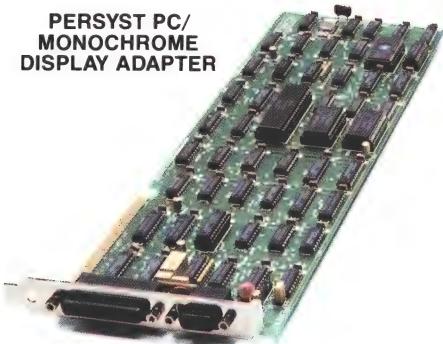
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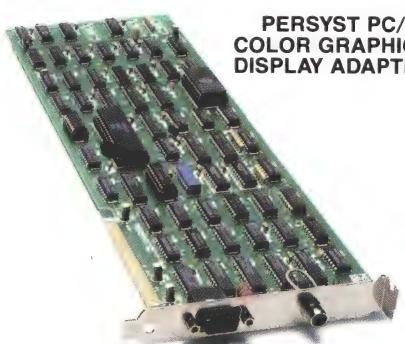
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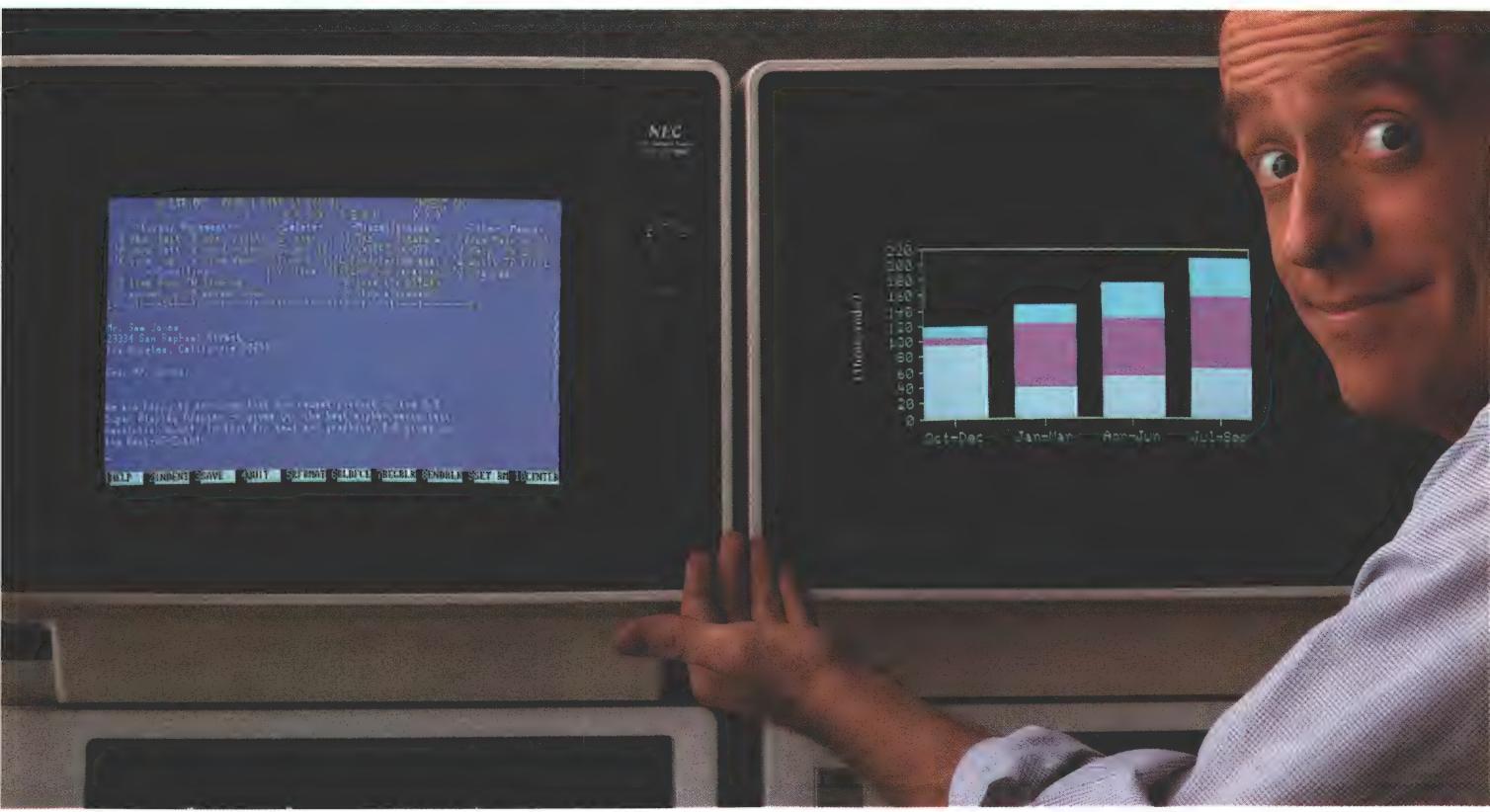
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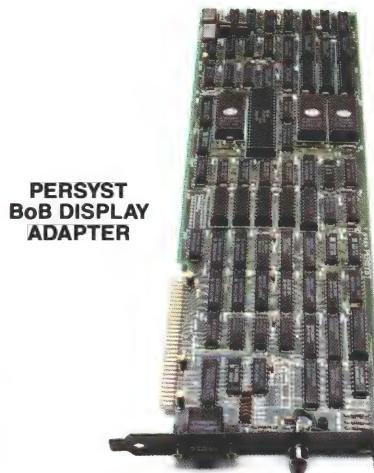
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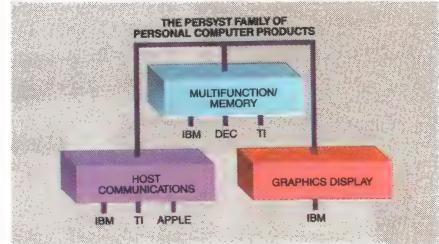
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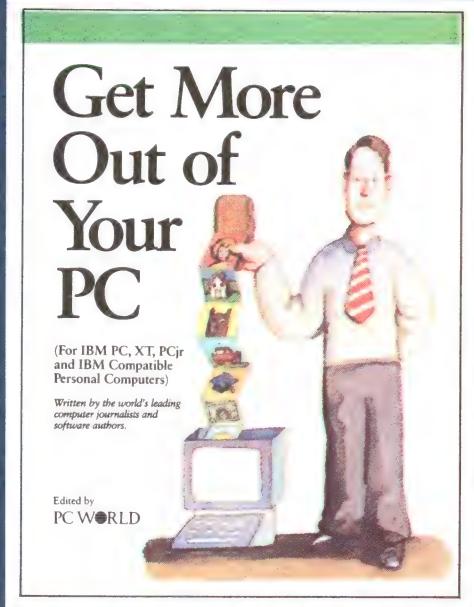
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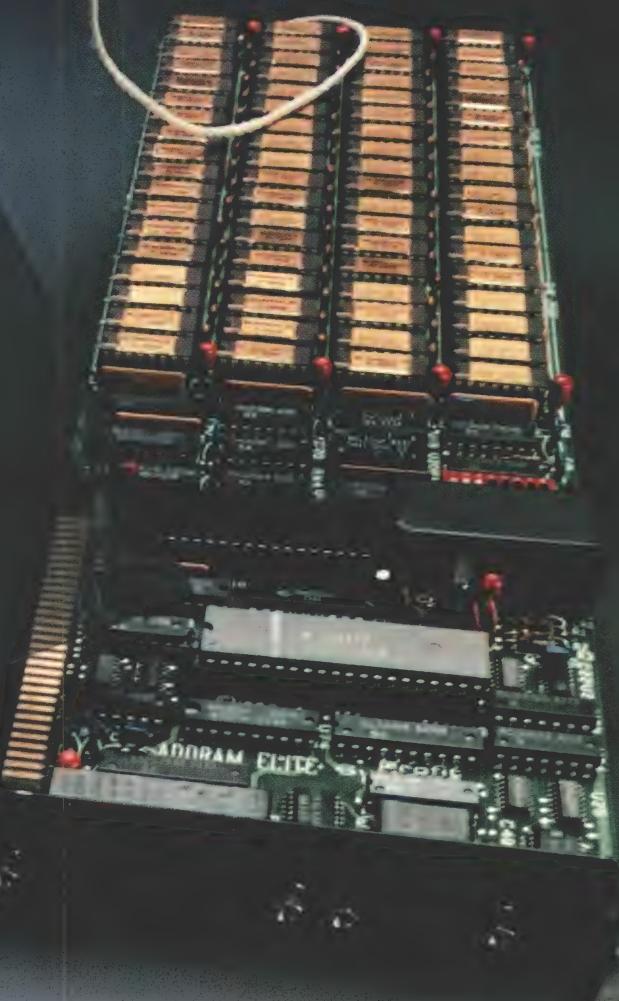
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42: L19 K19#D19

43-----

44: M19 L19-J19

45-----

46: N19 {E2J19>0,(M19/J19)*100,0}

47-----

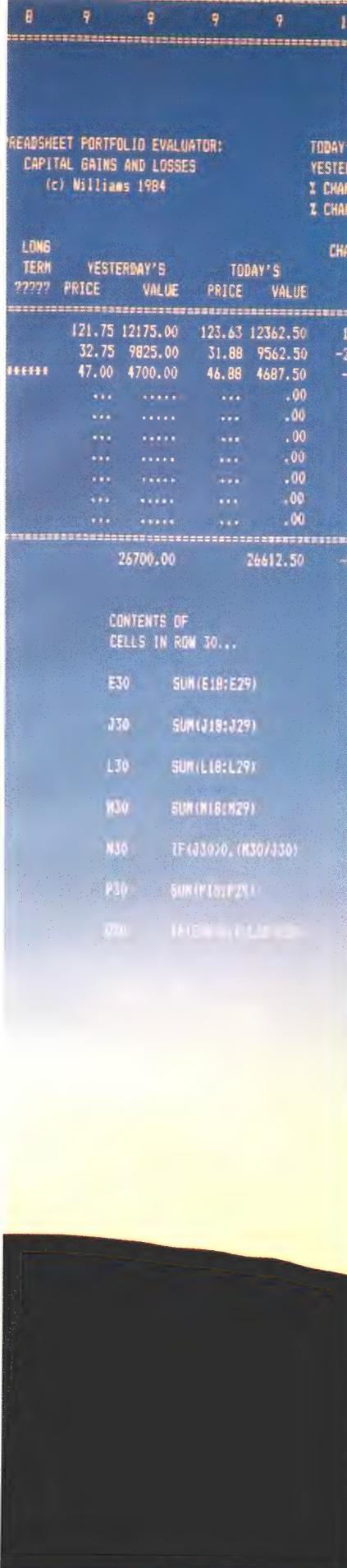
48: P19 L19-E19

49-----

50: Q19 {E1E9>0,(P19/E9)*100,0}

51-----





● Getting Started: Spreadsheets

Introduction to Spreadsheets

An electronic spreadsheet can transform your fanciful financial speculations into the numbers you need to plot the future course of your business.

Harry Miller

As its name suggests, an electronic spreadsheet is simply the computerized equivalent of an accountant's worksheet. Like its paper counterpart, an electronic spreadsheet is a grid of columns and rows that enables you to organize information in a standardized, readily understandable format.

Spreadsheets can be used to perform almost any task that previously had been done with pencil and calculator. Spreadsheets are commonly used for preparing budgets, evaluating proposals, comparing alternatives, and measuring results. To these tasks the spreadsheet brings increased efficiency and productivity. Compared to pencil and calculator, the spreadsheet is faster, more flexible, and less error prone. Once you begin using a spreadsheet to make calculations you will find yourself considering more options and forecasting further into the future because the spreadsheet has eliminated much of the tedium, leaving you free for creative decision making.

Spreadsheet Grammar

The intersection of a vertical column and a horizontal row in a spreadsheet creates a "cell." A cell can contain either a label (text) or a value (a number or a formula).

Formulas create relationships between values in specified cells. For example, you might want to add a column of numbers in cells B2, B3, and B4 and have the result appear in cell B6 (see Figure 1). To do that, cell B6 would contain a formula that depended on the values in the other cells. The formula might look like '+B2 +B3 +B4' or '@SUM(B2..B4)'. Going a step further, you might want to add several column totals across the spreadsheet, say to determine the annual total of the quarterly expense columns. The formula (in cell G6, G being the 7th column) that calculated the annual total would depend on the value of the cells to the left of it (cells B6 to F6). Formulas can be much more complex than simple sums; they can contain high-level financial calculations such as internal rate of return or intricate mathematical expressions such as logarithms or trigonometric functions.

The underlying concept of formulas is that they determine the value in one cell depending on values in other cells. Once you master this basic concept, spreadsheets are relatively easy to use. What's important is learning to rethink and express

● Getting Started

A	B	C	D	E	F
1	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	Annual
2 Food	1200	1320	1452	1597	5569
3 Rent	2100	2100	2100	2100	8400
4 Utilities	450	495	545	599	2088
5					
6	3750	3915	4097	4296	16058
7					
8					

Figure 1: Simple spreadsheet relationships. Cells in row 6 show the sums of the rows above them, and cells in column F add the values of the cells to their left and display annual totals.

business relationships in terms of values. For example, profit = income – expenses, or administrative expense = 15 percent of revenue. Once you have defined those relationships, you can analyze almost any situation that can be represented by numbers.

One of the reasons for the electronic spreadsheet's popularity is that it presents and works with data in a tabular format similar to that most managers encounter in their daily work. But the true magic of the spreadsheet lies in its ability to project and evaluate alternatives—the proverbial “what if” analyses. The principle of interrelated cells makes it easy to immediately see the effects of changing assumptions. When you type in a new value and press <Enter>, the change ripples through the model as the values of all the dependent cells are recalculated.

Common Features

Although programs vary, most electronic spreadsheets share a basic set of features. These features are implemented either by spreadsheet commands that usually affect large blocks of cells or by formulas that are tied to individual cells.

The following is a list of some of the most common spreadsheet commands.

Copy enables you to copy the contents of a cell (label, value, or formula) or group of cells into another cell or group. Most programs automatically adjust copied formulas to reflect their new locations; that is, the relationships in the formula stay the same—only the locations change.

Delete removes the column or row at the current cursor position and makes the necessary adjustments to subsequent cell addresses.

Format controls the way in which individual cells, columns, rows, or blocks are displayed. You can usually specify the width of a column, the number of decimal places displayed, whether the text or numbers in a column will be right- or left-justified or centered, whether thousands will be separated by commas, and whether negative numbers will be preceded by minus signs or surrounded by parentheses.

Insert adds a row or column anywhere in the spreadsheet and automatically adjusts the cell addresses of all the cells that were moved.

Load or *File Retrieve* fills the screen with a spreadsheet file that has been stored on a disk.

Move takes the contents of a cell or group of cells to a cell or group at a different location in the spreadsheet. Unlike Copy, Move does not leave a copy of the contents behind in the original cell or cells.

Print provides various methods for getting part or all of the spreadsheet onto paper.

Save places the current spreadsheet into a disk file.

Titles protects a row or column so that it is displayed at the top or the left edge of the screen regardless of how the rest of the spreadsheet might be scrolling by.

Window splits the screen either horizontally or vertically so that distant portions of a worksheet can be viewed side by side.

A function common to most spreadsheets is @SUM, which is used to add a column or row of numbers. Most spreadsheet programs also include some higher mathematical functions, such as average, absolute value, square root, sine, tangent, cotangent, logarithm, and exponentiation. The @LOOKUP function finds values from a previously entered table—a very useful feature for tax calculations, for example. Financial functions such as internal rate of return and net present value are also common.

Advanced Features

As more and more spreadsheet packages are adapted to take advantage of the IBM PC's unique capabilities, many advanced features are becoming standard. Some software com-

Code	Date			DATA TABLE FOR SUBTOTALS BY CATEGORY AND MONTH			
	Mo	Da	Amount	Mo	Code	Mo	
DEPT2	1	12	1000		51000	DEPT1	DEPT2
DEPT2	1	22	5500		1	0	6500
DEPT3	1	25	1000		2	3000	4000
DEPT1	2	3	3000		3	1000	0
DEPT2	2	15	4000		4	4000	5500
DEPT1	3	18	1000		5	5500	0
DEPT3	3	23	5500		6	0	7000
DEPT3	4	16	3000				4000
DEPT3	4	19	4000				0
DEPT1	4	22	3000				1000
DEPT1	4	25	1000				
DEPT1	5	4	5500				
DEPT2	5	17	4000				
DEPT3	6	1	1000				
DEPT2	6	25	3000				
DEPT2	6	27	5500				

Figure 2: A 1-2-3 data table. The table calculates sums for each combination of variables (month and code).

panies sell one program or a closely related group of programs that perform a variety of applications, such as spreadsheet, data management, word processing, business graphics, telecommunications, calendar, and project management. These packages, referred to as "integrated" products, allow you to follow your natural thought processes. For example, a data management problem or a spreadsheet question may come up while you are in the middle of a word processing file. With an integrated product you don't have to exit one program, remove the disk, put a different application in, and start it up. You merely place the first program on "hold," pull the other program up on the screen, do your work, and then return to the first program. This integrated approach makes exchanging data among various applications easy.

Several software companies now offer products that integrate applications at the operating system level. That means that you can use individual applications programs from

different software vendors and still have the convenience of moving easily from one application to the next as well as the ability to transfer data among applications. VisiCorp's *Visi On*, Microsoft Windows, and Quarterdeck's *DesQ* are examples of integrated products.

Some spreadsheets allow a user to redefine the meanings of certain key-stroke combinations. Labels, formulas, and commands that would normally require many keystrokes can be stored as one- or two-key commands. These redefinitions, called "macros," can be quite complex and can include long strings of commands with text or cell references embedded in them.

As you might imagine, keyboard macros can save significant amounts of time. A keyboard macro may be used in place of a very short but awkward cursor movement that is commonly used. If you have to enter data in the first and fifth column of each row, a simple cursor-movement macro (e.g., {down}{left}{left}{left}{left} in 1-2-3 by Lotus Development Corporation) can be very helpful and satisfying.

In addition, key redefinition (via either the internal capabilities of the program or a separate keyboard macro program such as *ProKey*) can free up keys that have several functions. For example, the cursor-movement function of the arrow keys on the numeric keypad could be moved to another part of the keyboard, freeing the numeric keypad for quicker data entry.

To date, 1-2-3 is the only program that has an automated data table feature. This impressive function lets you define a matrix of possible combinations of variables to be used in a model. The data table function runs through the spreadsheet model using each combination of variables in turn and reporting the result in the matrix. (See Figure 2.)

Comparison Shopping

Although most spreadsheet programs perform the same functions, programs differ significantly in style and capability. Almost any of the spread-

Getting Started

A Spreadsheet Sampler

There are nearly 50 spreadsheet packages on the market; the following is a list of the most notable among them. Some of these packages, such as *VisiCalc*, are solitary travelers in the world of software and perform only the spreadsheet function. Others, such as 1-2-3, are integrated and may include data base, graphics, word processing, and communications programs on the same disk or work with a family of packages providing these services.

MicroPlan
Chang Laboratories, Inc.
5300 Stevens Creek Blvd. #200
San Jose, CA 95129
408/246-8020
List price: \$495

MBA
Context Management Systems
23868 Hawthorne Blvd.
Torrance, CA 90505
213/378-8277
List price: \$695

1-2-3
Lotus Development Corp.
161 First St.
Cambridge, MA 02142
617/492-7171
List price: \$495

PlanStar
CalcStar
MicroPro International Corporation
33 San Pablo Ave.
San Rafael, CA 94903
415/499-1200
List price: PlanStar \$695,
CalcStar \$195

Multiplan
Microsoft
10700 Northup Way
Bellevue, WA 98004
206/828-8080
List price: \$275

Perfect Calc
Perfect Software
1400 Shattuck Ave.
Berkeley, CA 94709
800/222-4222
List price: \$295

SuperCalc3
Sorcim Corporation
2310 Lundy Ave.
San Jose, CA 95131
408/942-1727
List price: \$395

VisiCalc IV
VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
408/946-9000
List price: \$250

sheet programs listed in "A Spreadsheet Sampler" will perform simple budgeting and projection tasks. But some approach these tasks in a way that most closely matches the way you like to work. You should consider how each of the programs you look at handles the following features.

Command structure and menu style. Although most spreadsheets use the same basic commands, the method of issuing those commands can vary greatly. *VisiCalc* and *SuperCalc* display a prompt line of initials at the top or bottom of the screen that represents possible command choices; 1-2-3 uses a menu of full-word commands supplemented by a one-line description of what the currently selected command does or what choices are available at the next level. For flexibility, 1-2-3 also lets you issue commands by typing their initials.

On-line help. At its best, on-line help means that by pressing a key you can have access to one or more screens that explain the function being used and describe what you can do next. This type of context-sensitive help screen can save time that would have been spent flipping through a user manual. At the other end of the spectrum, a call for on-line help displays a skimpy description with little (if any) information about which commands might be currently appropriate.

Data capacity per cell. When long labels are necessary, an application requires especially long formulas, or a data field must be longer than most spreadsheet data, the limitation on the number of characters that will fit in a single cell can make a difference. Maximum cell capacities range from as few as 80 to as many as 8000 characters. Capacity is different, by the way, from maximum column width. Some spreadsheets let you store more characters in a cell than are displayed.

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100% compatible with the IBM Monochrome Adapter Board, IBM's highest quality text mode	YES	YES		YES	YES	YES	
100% compatible with the IBM Color Graphics—for RGB and composite video monitors, lightpen	YES		YES	YES	YES		
Operate standard IBM Color Graphics software on the IBM Monochrome Display—(Lotus Graphics, etc.)	YES					YES	
Connect two monitors simultaneously and switch either by software or an external switch	YES				YES		
Graphics resolutions on the IBM Monochrome Display of 720 x 700, includes advanced software support	YES		YES				
Graphics resolution on an RGB Monitor of 640 x 400 with 16 colors, includes advanced software support	YES			YES			
Requires device drivers to operate Lotus 1-2-3 Graphics on an IBM Monochrome Display	NO		YES	YES		NO	
Includes a standard IBM Parallel Printer Port	YES	YES	YES		YES	YES	YES
Operate with a standard television set	YES	YES	YES	YES	YES		

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Getting Started

A Few Spreadsheet Tips

Create a separate data input area to hold assumptions, opening balances, base figures, and other data. The best place for the input area is the upper left corner of the worksheet. The body of the worksheet should contain only formulas and references to data input area cells. That way you can easily see what assumptions results are based on.

Establish separate areas in the spreadsheet for data input, criteria (for sorts or searches), and output (results) and then an area to store all keyboard macros. The data management input area stores all the data that will be searched, sorted, or extracted and might actually be the worksheet body of data.

Use templates. Setting up a basic model of a spreadsheet and saving a copy of the model with no data (a template) will allow

you to use that model again and again without wasting time re-creating it. Just load the file holding the template you've created, key in the data, and save the resulting worksheet under a unique name. Leave room at the top of the template for the date and notes about what data it contains.

Once you become proficient with templates, you might consider writing keyboard macros that build the templates "on the fly." Such macros take up less memory and disk storage space than templates but may load a little slower. (See "/X Marks the Macro," PCW, Vol. 2, No. 3, for an example of this technique.)

Include cross-checks. A prudent spreadsheet model should calculate important values more than one way to cross-check the results. Have an @IF statement

signal when a cross-check discrepancy is found. For example, in Figure A the annual total in cell F6 could also be calculated as the sum of cells F2 to F4. As a cross-check, you could type the formula @SUM(F2..F4) in cell F10. Then in cell F15, type @IF(F10<>F6,11111111,0). That will display a 0 if the sum in F10 matches the number in F6 and will display a row of 1's if there is a discrepancy.

Experiment. It's easy to change values and watch the results. Do it often and you will get a better feel for spreadsheet software. Substitute some wildly optimistic or pessimistic values for your assumptions. You may gain insight into the way your model works that wouldn't come out under normal circumstances.

A	B	C	D	E	F	G
1	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	Annual	Cross-check
2 Food	1200	1320	1452	1597	5569	
3 Rent	2100	2100	2100	2100	8400	
4 Utilities	450	495	545	599	2088	
5						
6	3750	3915	4097	4296	16058	16058
7						0
8						

Figure A: The formula in cell F6 calculates the annual total as the sum of cells B6 to E6. The formula in cell G6 calculates the same value, but as

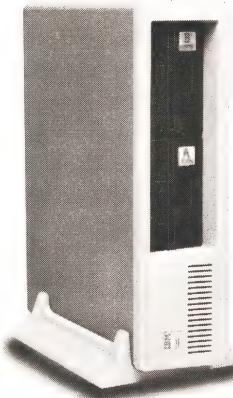
the sum of column F. The formula in cell G7 says: if cell G6 is not equal to cell F6, display a row of 1's; otherwise, display a zero.

Maximum spreadsheet size. Perhaps more important than cell capacity is the spreadsheet's maximum size, as measured by the number of columns and rows it can contain. Typical spreadsheet applications use small areas, but when you need a few more cells, you need a few more cells. *VisiCalc*, *SuperCalc*, and *Multiplan* spreadsheets allow 63 columns and 254 rows. *1-2-3* worksheets can contain 256 columns and 2048 rows.

Absolute size specifications can be misleading, however. Values, labels, and formulas take up different amounts of memory. To fill every cell in a *1-2-3* worksheet, you'd have to use only values (no formulas) and have a computer loaded to the brim with RAM (random access memory—the computer's main memory, consisting of chips in the system unit). Programs also differ in the way they store blank cells. For example, *1-2-3* reserves enough memory to hold a spreadsheet whose size is defined by the cells furthest down and to the right that contain data, and continues to reserve that amount of memory even after that data is erased. That means that you might need much more memory with *1-2-3* than with some other programs to fill a similarly sized worksheet.

Merging worksheets. Microsoft's *Multiplan* takes a different approach to spreadsheet size than *1-2-3*. Although *Multiplan* can use only 64K of user memory (RAM), the ability it provides to link worksheets means you can create "virtual" (or "conceptual") worksheets of almost unlimited size. When a large spreadsheet must be split into smaller sheets, those sheets are either dependent or supporting. The supporting sheets hold data that is used by the dependent sheets. If a value designated for such a connection is changed on the supporting worksheet, the related values on the dependent worksheet are automatically

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● Getting Started

updated the next time the dependent sheet is used. This is a slightly tricky but powerful technique, since smaller worksheets are invariably easier for a spreadsheet user to handle than larger ones.

Naming cells and ranges. Some spreadsheet programs let you assign a name to a cell or a range (block) of cells. This feature adds convenience and flexibility. Referring to a range of cells called "Prices" is easier than remembering that the prices are in cells A1 through A15. More importantly, if a formula refers to the range called "Prices," it will still find those prices if the range containing them is moved to another part of the spreadsheet. If you failed to name the range or had a program that lacked this feature, when you moved the range you would have to go back and change all the formulas that refer to that range to reflect the new location.

Speed of calculation. A spreadsheet's calculation speed depends on several factors. Does the program do all of its work in memory, or must it frequently access the disk? (The mechanical disk drive is much slower than the purely electronic process of manipulating data in memory.) What language is the program written in? (Assembly language is faster than C, which is faster than Pascal or BASIC, which are faster than the p-System.) What mathematical methods and algorithms are used? What degree of accuracy is attained?

Testing the relative speed of spreadsheet programs usually requires using a reasonably large model. Such a model can be built by copying a few formulas over a large area of the worksheet.

Automatic and manual calculation. Most spreadsheet programs automatically recalculate an entire spreadsheet each time any value is changed. As a worksheet gets larger, the time wasted watching the program redraw the screen becomes more and more significant. Some programs allow you to set the calculation mode to manual so that the worksheet is not recalculated until you give the command.

Forward and circular references. Most spreadsheet programs recalculate row by row; that is, they calculate the formulas in row 1, then they go to row 2, and so on. Some programs let you change the order of recalculation so that it works column by column. Either way, there's a potential problem: if a formula depends on a value that is recalculated after the formula is calculated, you may get an error known as a forward reference—a cell formula that refers to a value not yet calculated.

Suppose you have a simple *Visi-Calc* or *SuperCalc* worksheet with three filled cells (see Figure 3). In cell A1 you enter the value 10; in cell B1 you type the formula C3*10 (the value in C3 times 10); and in cell C3 you use the formula A1*2 (the value in A1 times 2). When you start out, A1 = 10, B1 = 200, and C3 = 20. If the value of A1 were changed to 1, you can see the problem. With sequential, column-by-column recalculation, B1 would still be 200. This value remains the same, even though C3, the cell it depends on, has changed value from 20 to 2, because C3 was recalculated later.

Some sophisticated spreadsheet programs such as 1-2-3 avoid the forward reference problem by using a "natural order" of recalculation. A formula is not recalculated by 1-2-3 until the program has calculated all of the formulas on which it depends. If 1-2-3 finds a forward reference, it goes forward and calculates the forward formula.

No spreadsheet, however, can deal with the circular reference, in which one cell's formula depends on a second cell, whose formula depends on the value of the first cell. Circular references get you nowhere fast.

Data entry forms. One of the nice things about spreadsheets is that they display data in a tabular fashion that makes it easy to use. But entering data into such a format (particularly with a large spreadsheet) has all the efficiency of hunt-and-peck typing.

Some spreadsheets (*Context MBA* is the most impressive example) have forms modes whereby you can enter data on a screen form that you design. The data is then automatically copied into a spreadsheet's tabular format. Some other spreadsheets have the potential, if not the built-in capability, to accomplish this with macros.

Flexible cursor control likewise makes data entry much easier. A spreadsheet program should make good use of the PC's keyboard, including the <Home>, <End>, <PgUp>, <PgDn>, and function keys.

A spreadsheet is a handy tool, but it is not a decision maker. A spreadsheet assembles and organizes all the data and facts about a decision or a plan and then performs calculations that indicate the consequences—for example, profit or loss or cash flow. Remember—you control the assumptions and therefore the results. ●

Harry Miller is the Editor of PC World.

A1: 10

READY

1 A 10 B
2 C
3 D
4 E
5 F
6 G
7 H
8 (A)

A1*2

A1: 10

READY

1 A 10 B 200
2 C
3 D
4 E
5 F
6 G
7 H
8 (B)

20

A1: 1
*

LABEL

1 A 1 B 200
2 C
3 D
4 E
5 F
6 G
7 H
8 (C)

2

A1: 1

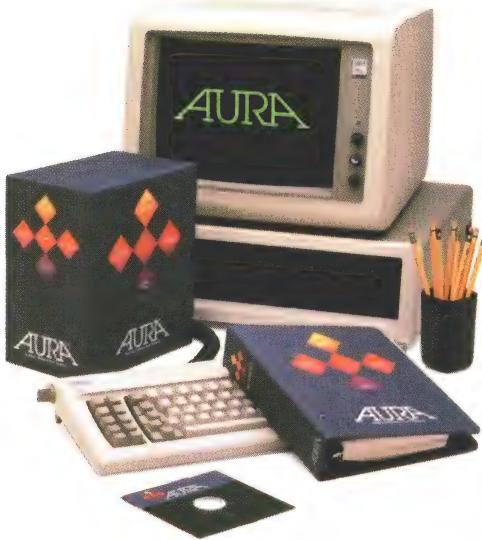
READY

1 A 1 B 20
2 C
3 D
4 E
5 F
6 G
7 H
8 (D)

2

Figure 3: Forward references. Formulas entered in three cells (A) result in simple calculated values (B). When the value of cell A1 is changed to 1, cell B1 doesn't change if the spreadsheet is simply calculated column by column or row by row (C). However, 1-2-3's natural calculation presents the correct results (D).

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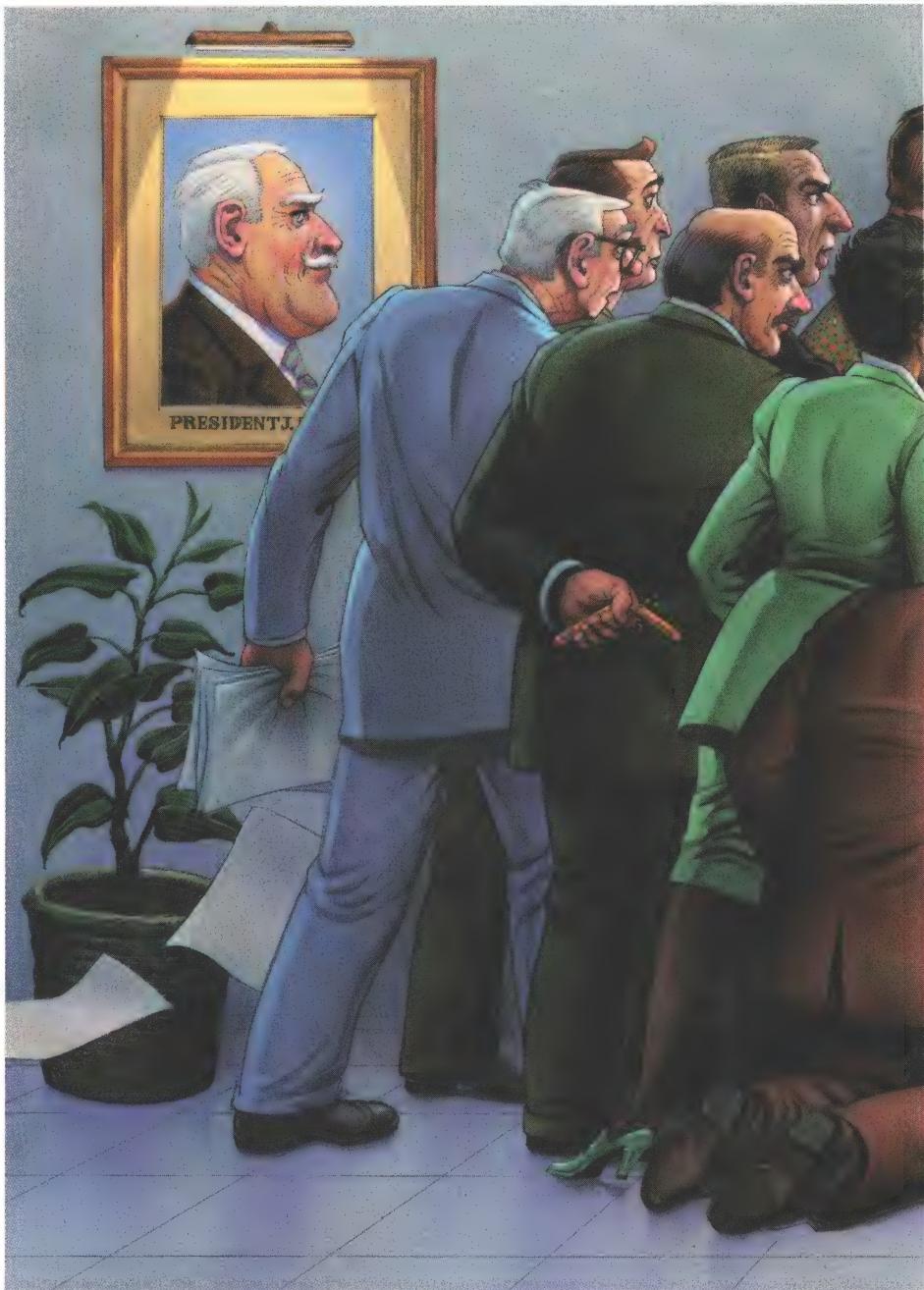
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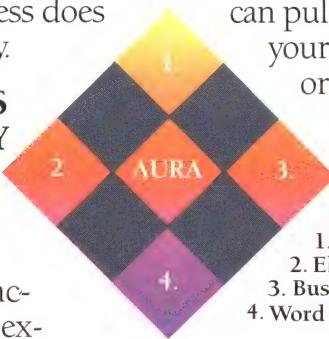
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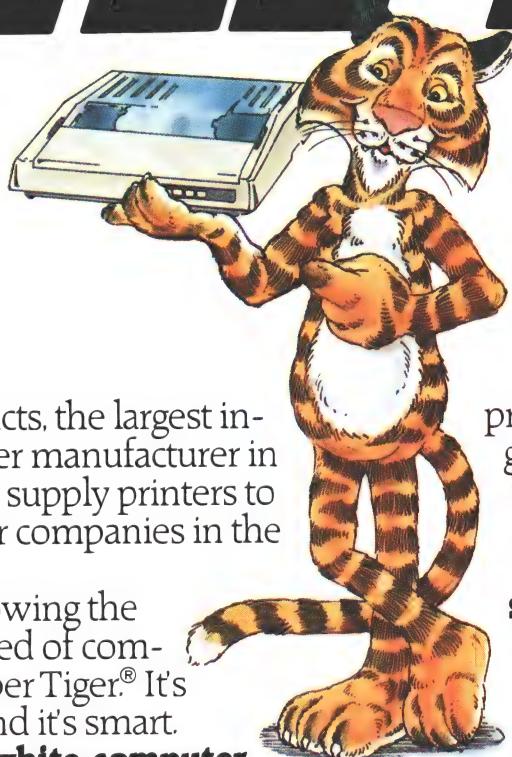
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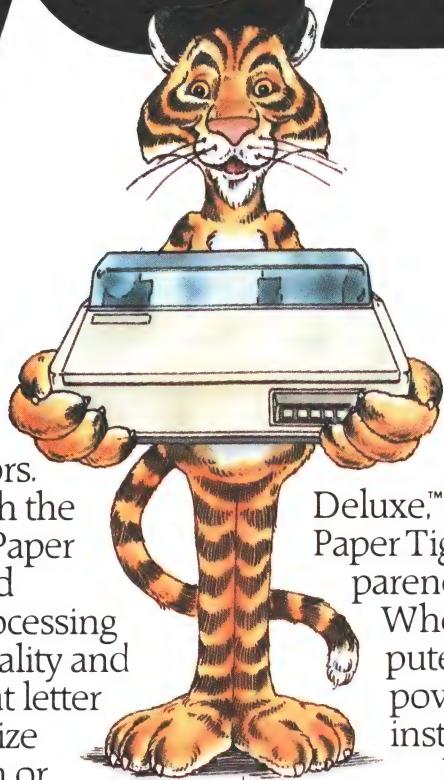
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PC World offers answers and advice at every level.

Karl Koessel

This month we find out why a disk that's only half full will not accept more files—and what can be done about it—by looking at how a disk stores directory entries. Our second item discusses how to search the extended directory path that is defined by the PATH command. It also offers a suggestion for facilitating the use of 1-2-3 with DOS 2.00's tree-structured directory system. Last, we have hardware questions about the IBM's serial board and the XT's hard disk.

Disk Directories

Q. I recently encountered a problem while working on my IBM PC with PeachText, Peachtree's word processor. I found that I was unable to place more than 112 documents or other files (counting the two hidden system files) on a double-sided floppy disk, yet nearly half of the disk space was still available. However, the problem is not with the Peachtree software. DOS 1.10 utilizes a set amount of disk space (3584 bytes on a double-sided disk) for the disk's file directory. Each entry in the directory takes up 32 bytes to record such things as a file's name, size, and location on the disk. Thus there is room for only 112 entries. I'm wondering if you know if there is any way the number of files in the directory can be increased.

Edward F. Cowman
Freeport, Illinois

A. The maximum number of directory entries is set when the disk is initialized by the FORMAT command. When a disk is formatted, this number and other information about the disk is stored in the first portion, or sector, of the disk. This number determines how many of the next sectors on the disk FORMAT reserves

There is a way to put more files on your disks by using the tree-structured directories of DOS 2.00.

for the directory entries. In fact, the maximum number of directory entries for a single-sided disk is 64; the number of entries for a hard disk is based on the size of the DOS partition. Although the number of entries allowed can be changed, doing so is complicated and best left to those who design operating systems and device drivers.

However, there is a way to put more files on your disks using the tree-structured directories of DOS 2.00. The FORMAT command of DOS 2.00 creates a disk's directory in the same manner as does DOS 1.10, limiting the directory to 112 entries on a double-sided disk. But in DOS 2.00 you can create and name subdirectories—files that act as separate, additional directories.

To add the subdirectories, format a new disk in drive B: using DOS 2.00. Then create a subdirectory called PEACHTXT with the command MKDIR B:\PEACHTXT. (You can also use the abbreviated command MD B:\PEACHTXT. Both MD and MKDIR mean "make directory.") The subdirectory you make is actually a file, and its name and other directory information become an entry in the initial, limited directory, or root directory. Type DIR B: <Enter> to list the files in the current directory of the disk in the B: drive; the file name PEACHTXT will be followed by <DIR> to indicate that this file is a subdirectory. Next change the current directory of this disk from the root directory to the PEACHTXT subdirectory with the command CHDIR B:\PEACHTXT (or CD B:\PEACHTXT).

Now you can use *PeachText* from drive A: and save your documents to drive B:. The documents you save to drive B: will automatically be stored in the PEACHTXT subdirectory, and since the subdirectory is a file and not a limited set of sectors like the root directory, its size is not limited, and it will store as many files (directory entries) as you can fit on the disk.

Having 112 files and documents in about half the space of a 320K disk means the files average less than 1.5K each. If the disk holds a large number of small memos or letters, another solution to accessing the free space

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on the disk is possible without upgrading to DOS 2.00. Use DOS's COPY command to combine several of your small documents into one large document. Then ERASE the small documents, reducing the number of file entries in the disk's directory. The unused part of the disk is now available for storing new files, as the disk will now have space in the directory for new entries.

The format for combining files with the COPY command is

COPY B:X.DOC + B:Y.DOC B:Z.DOC

This creates the file Z.DOC by copying X.DOC and then appending a copy of Y.DOC. You do not have to specify a name for the result file. You could shorten the command to

COPY B:X.DOC + B:Y.DOC

However, when a result file name is not specified, the result file is given the name of the first of the files to be combined (X.DOC in the example).

You can easily find a particular memo or letter within the large combination document by using the word processor's search function to find a unique set of characters (for example, a correspondent's last name).

Subdirectory PATHs

Q. We have had our IBM XT with DOS 2.00 for about two months and have developed a certain amount of confidence and expertise in using it. It has become obvious that file management, and therefore the tree-directory system, in DOS 2.00 is a significant feature. However, neither the IBM DOS manual nor any other book that I've seen has done a good job of demonstrating (beyond command definitions) the power of tree-structured directories. Any suggestions you could provide on how to make use of them would be appreciated.

Specifically, the purpose of the PATH command is stated in the DOS manual as, "Causes specified directories to be searched for commands or batch files that were not found by a search of the current directory." This suggests that you can have your cake and eat it too. I put a PATH command in our AUTOEXEC batch file and hoped to be able to run Lotus's

For example, let's assume you have a hard disk as drive C: with a subdirectory called DOS containing the DOS file COMP.COM and another subdirectory on a floppy disk in drive A: called SUB containing the file PRG.COM. Let's also assume that you have changed to a directory on drive A: that does not have any of these files (let's call it NONE). Now issue the command PATH C:\DOS; A:\SUB to define the paths to these two additional directories so that they will be searched if a command is not found in the current directory of the default drive (see Figure 1).

In the command COMP PRG.COM C:PRG.COM the first "word" entered on the command line, 'COMP', is the command, and the "words" or characters that follow, 'PRG.COM' and 'C:PRG.COM', are the command's parameters. COMP will try to find the two files specified as the command's parameters, compare the files byte for byte, and inform you whether or not the files are the same. So when COMP is not found in the current directory of the default drive (A:\NONE), DOS will search the directories set by the PATH command one at a time, in the order they were defined, until the file is found (COMP will be found in the C:\DOS directory).

But the file PRG.COM will not be found. Because the file name PRG.COM is being used as a parameter of the command COMP and not as a command itself, DOS will search only the current directory of the default drive for this file. Therefore, to find PRG.COM, you must prefix the file name with the path to the directory in which it resides. The path to C:PRG.COM, of course, must also be specified. So if the path to the sub-

DOS will search the directories set by the PATH command if the commands are not found in the current directory of the default drive.

1-2-3 even when the current directory did not contain 1-2-3. We have been unable to use files without using the DOS command CD to change directories.

Must a file be either a .COM or .BAT file to be accessed from a different directory via the extended search path set by the PATH command?

Harold A. Eaton
Houston, Texas

A. No, a file does not have to be either a .COM or .BAT file to be accessed via the extended search path. But the file name must be used on the DOS command line (the line following the DOS prompt) as a command, not as a file name parameter to a command.

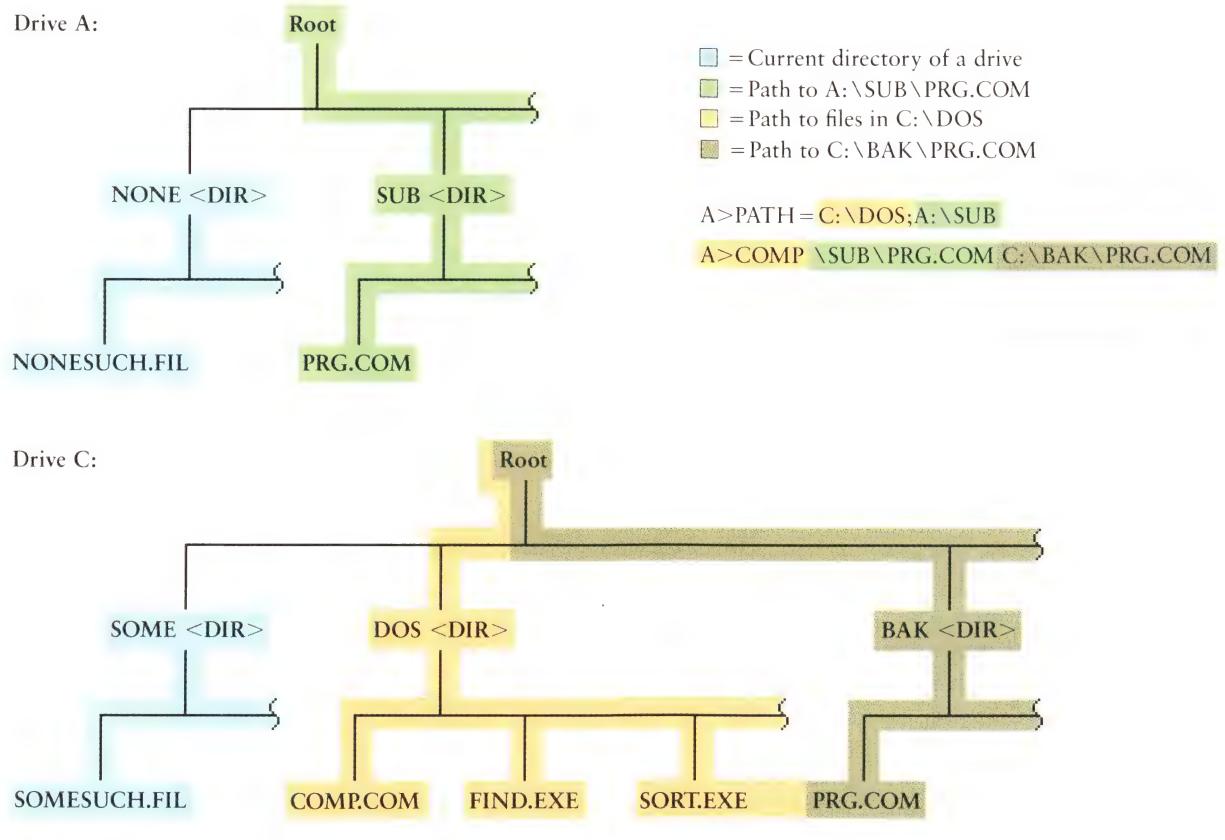


Figure 1: DOS will search directories defined by PATH for a command not found in the current directory of

the current drive, but a file name parameter must be prefixed by the path to its directory.

directory containing C:PRG.COM is C:\BAK, the command should be COMP A:\SUB\PRG.COM C:\BAK\PRG.COM

Generally DOS commands invoke .COM, .BAT, or .EXE files and are entered directly after the DOS prompt. DOS commands can also be written on the command line following the vertical bar character (!), which is used to chain together commands; the output of the command preceding the vertical bar is used as

input to the command following. Therefore, if the subdirectory DOS containing the DOS files FIND.EXE and SORT.EXE has been included in the PATH definition, the command DIR C: ! FIND "<DIR>" ! SORT > SUBDIRS will find and sort all the subdirectory names in the current directory of drive C: and write the results into a file called SUBDIRS in the current directory of the default drive (C:). DOS will search the directories set by the PATH command if the commands FIND.EXE and SORT.EXE are not found in the current directory of the default drive.

When loading the Lotus Access System or 1-2-3 itself, the support files needed to load the main program properly (such as the configuration file 123.CNF and the terminal driver TD.DRV) are not specified as parameters on the command line and therefore must be in the current directory of the default drive. However, once loaded, version 1A of 1-2-3 will allow you to read and write files to different subdirectories. The subdirectory that your files will be saved to and read from is set through the

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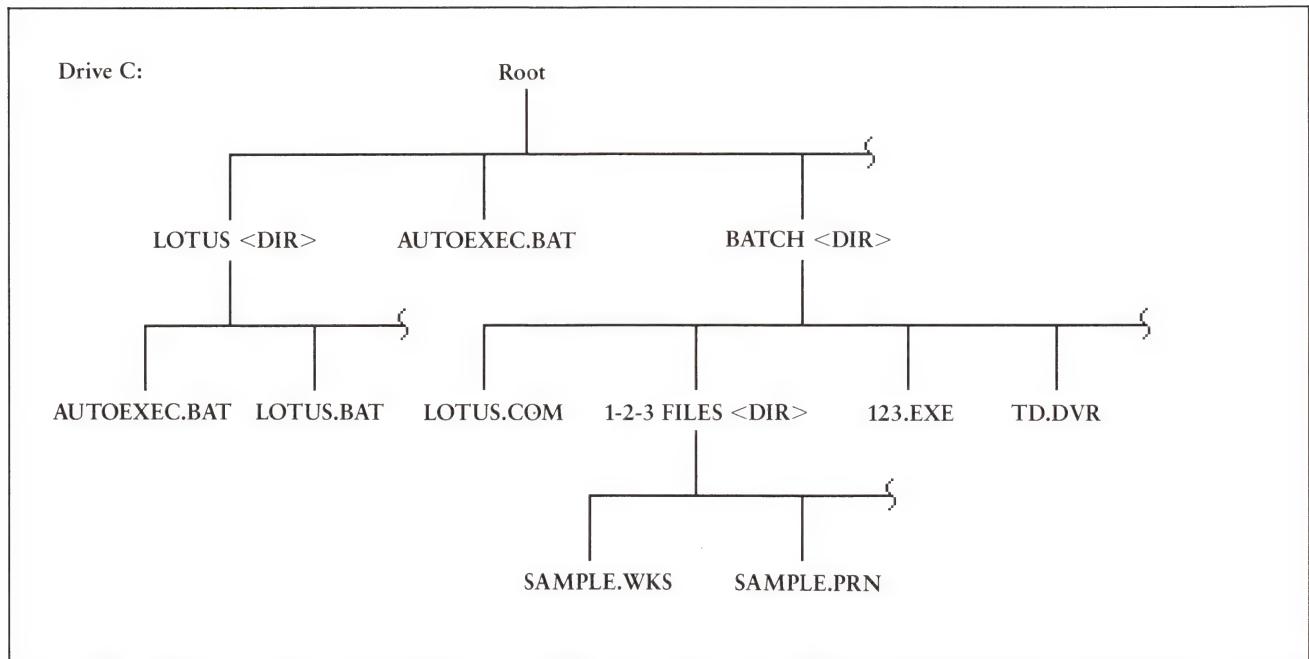


Figure 2: Subdirectory arrangement, used with a PATH that includes C:\BATCH, to facilitate using 1-2-3 from a hard disk

1-2-3 command /File Directory. The following procedure may help you use 1-2-3 from your hard disk.

First you will need a subdirectory that contains all the necessary 1-2-3 files. To create it, change to the root directory of the hard disk (with the command `CD C:\`), make a subdirectory called LOTUS (`MD C:\LOTUS`), and copy all the 1-2-3 files into this subdirectory (`COPY A:/*.* C:\LOTUS`). Next you will need a subdirectory in which to keep your worksheet, graph, print, and other files. This subdirectory can have any name, but it must be created before it can be used. Let's make it a subdirectory of the subdirectory LOTUS and call it 123FILES (`MD C:\LOTUS\123FILES`). You

will also need a subdirectory called BATCH (`MD C:\BATCH`) to hold the batch file LOTUS.BAT. Now to make LOTUS.BAT, type the following:
`COPY CON C:BATCH\LOTUS.BAT <Enter>`
`C: <Enter>`
`CD C:\LOTUS <Enter>`
`C:LOTUS <Enter>`
`<F6> <Enter>`

Next add the path C:\BATCH to the set of directories defined by the PATH command in the AUTOEXEC.BAT file. (It's a good idea to keep a copy of the AUTOEXEC.BAT file in the BATCH subdirectory, too, in case the original in the root directory is overwritten.) Now you can access the file LOTUS.BAT regardless of what the current directory or default drive is. LOTUS.BAT will change the default drive to C: and the current directory on drive C: to the

subdirectory LOTUS. If your original Lotus System Disk is in drive A:, LOTUS.BAT will load the Lotus Access System from the Lotus subdirectory. Figure 2 illustrates this arrangement.

More information on the PATH command and DOS 2.00's tree-structured filing system can be found in "MS-DOS 2.00: A Hands-On Tutorial" (PCW, Vol. 1, No. 3).

IBM's Hardware

Q. I have two questions that I would like very much to have answers for. They both relate to the PC XT. First, the XT comes equipped with an asynchronous communications board installed as COM1: I

have added a Hayes internal modem that, for compatibility with some important communications software, I have to use as COM1:. To do this I have had to remove the IBM asynchronous board. I would like very much to reinstall the asynchronous board as COM2:, but there are no switches on it or any documentation on how this might be done. I have been told that it is possible, but no one has been able to tell me how to do it.

Also, there are times when I really don't need to use my hard disk, such as when I am working for hours on a mainframe and just use my XT as a terminal. Since my warranty has expired anyway, I don't mind experimenting if I have some guidance. Could I install a switch somewhere and boot my system without the hard disk when it is not needed? If this is possible, would it be worth saving a few hours of idle running time on the hard disk? I know it would be quieter and more enjoyable working without it when I don't need it.

Bob Stephan
Pebble Beach, California

A. The IBM Asynchronous Communications Adapter does not have any switches, but there are two "programmed shunt modules" located in two sockets next to the board's mounting bracket, one in the top row of chips and one in the bottom row (see Figure 3). The programmed shunt modules each have a dot painted at one end and may be plugged into their sockets with the dot up (towards the top of the board) or

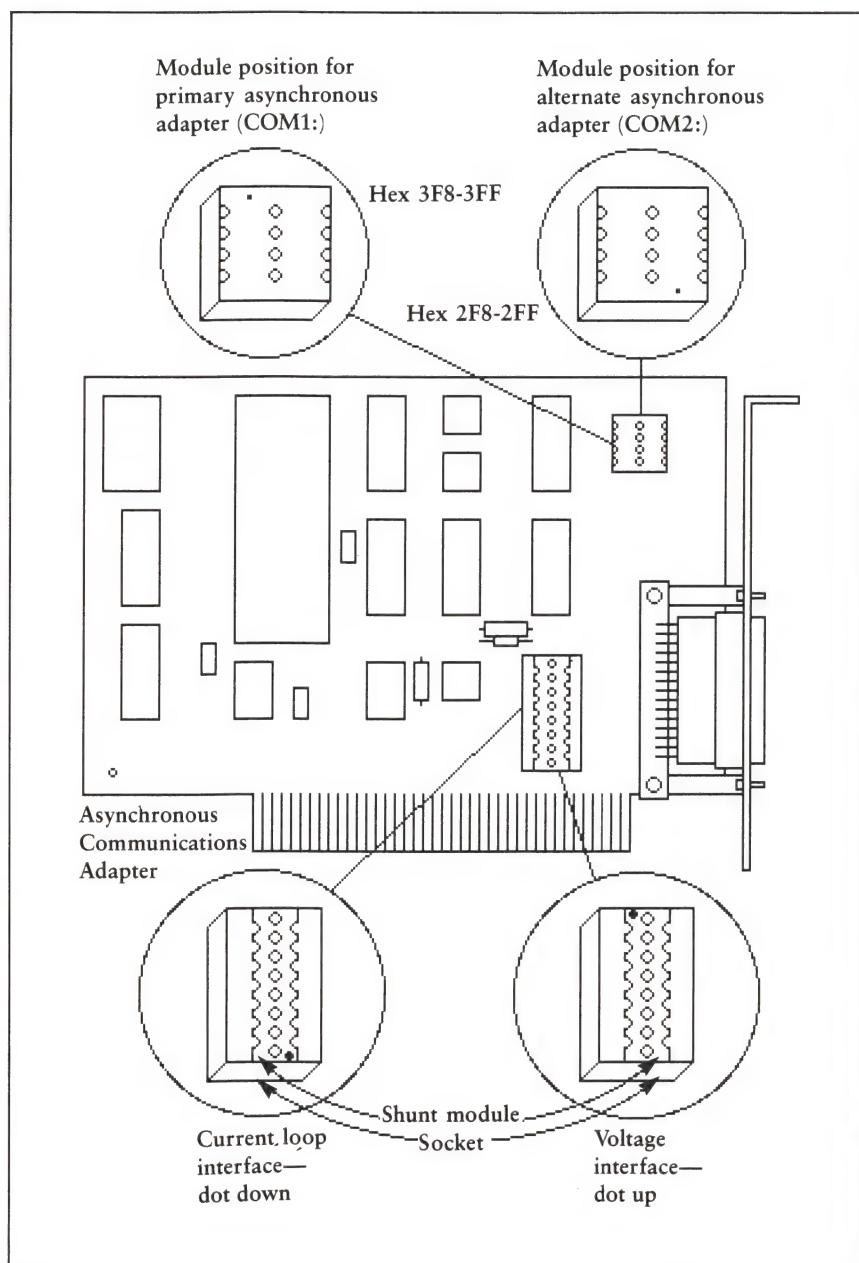


Figure 3: Selecting the interface format and adapter address for the IBM Asynchronous Communications Adapter

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with the dot down (towards the bottom). The module in the bottom row selects the serial interface format; the current loop interface is selected if the dot is down and the voltage interface is selected if the dot is up. The module in the top row selects the adapter address; the address is set for COM1: if the dot is up and for COM2: if the dot is down. To re-install the board as COM2:, just flip the module in the top row.

As to your second question, you can install a switch in the hard disk's power line inside your XT to disable the hard disk when you don't need it. When you boot up the XT with the hard disk disabled, you will see the error message '1701' after the memory test is completed. This message may be ignored; it simply means the hard disk is not working. This may make working quieter and more enjoyable, but I doubt it will extend the life of the hard disk significantly.

You should turn the newly installed switch on and off only when the XT is off; turning the hard disk on or off while the computer is on may produce voltage surges, corrupting memory and locking up the computer. Another caution, since you often don't use the hard disk: when you need to relocate the computer, don't forget to "land" the heads of the hard disk. This procedure, which is on the XT Diagnostics Disk, positions the heads away from the portion of the disk that holds data in order to protect the data from possible damage during shipping.

Do you have any questions concerning the IBM PC or compatibles? Send them to The Help Screen, PC World, 555 De Haro St., San Francisco, CA 94107. ☀

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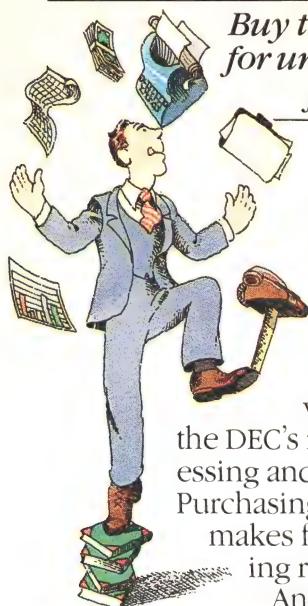
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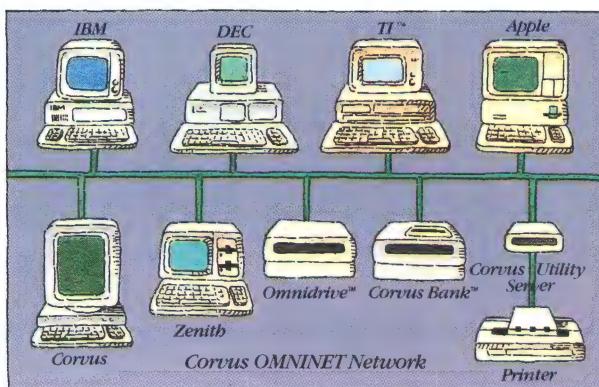
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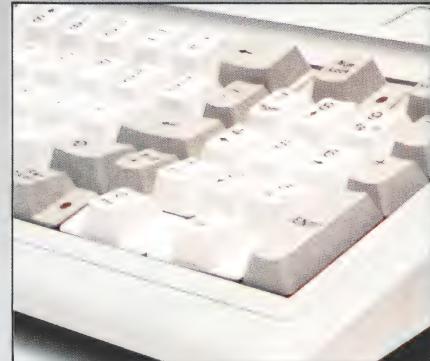
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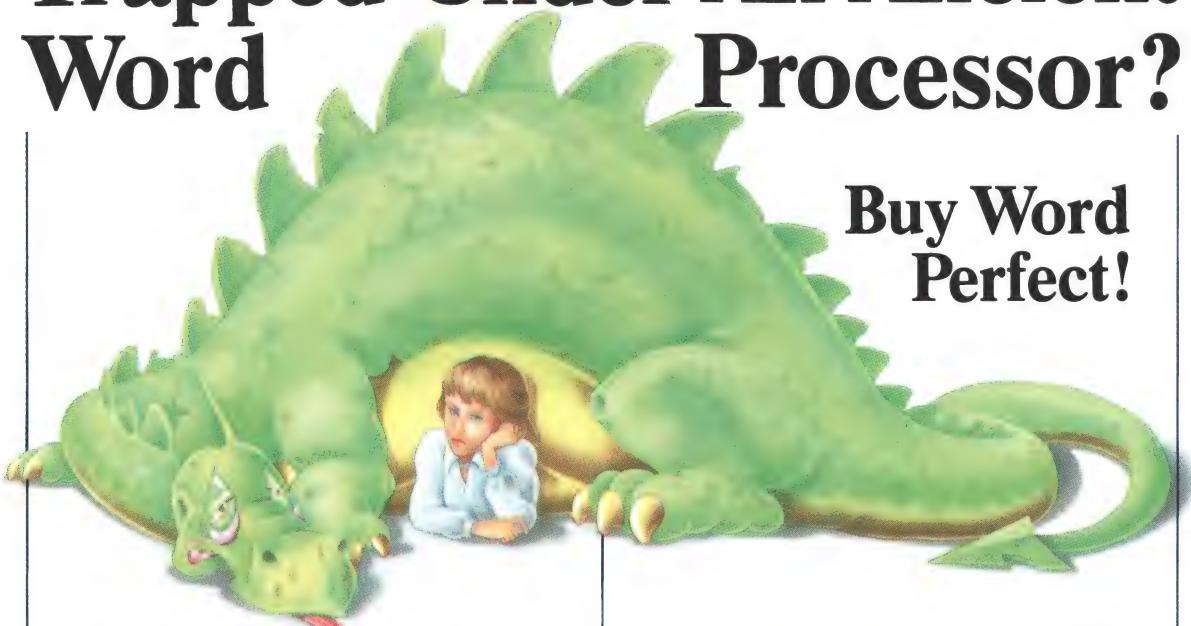
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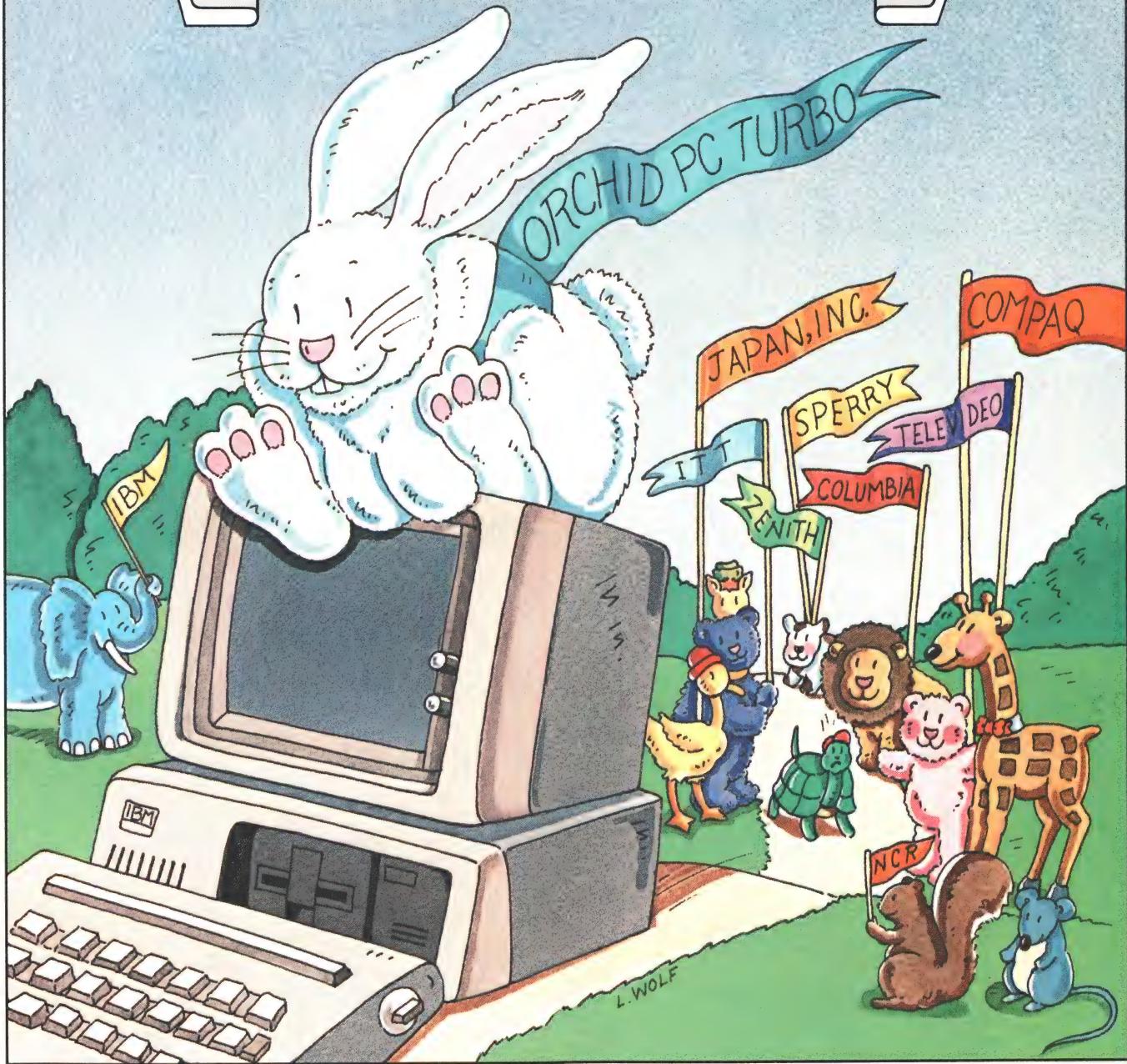


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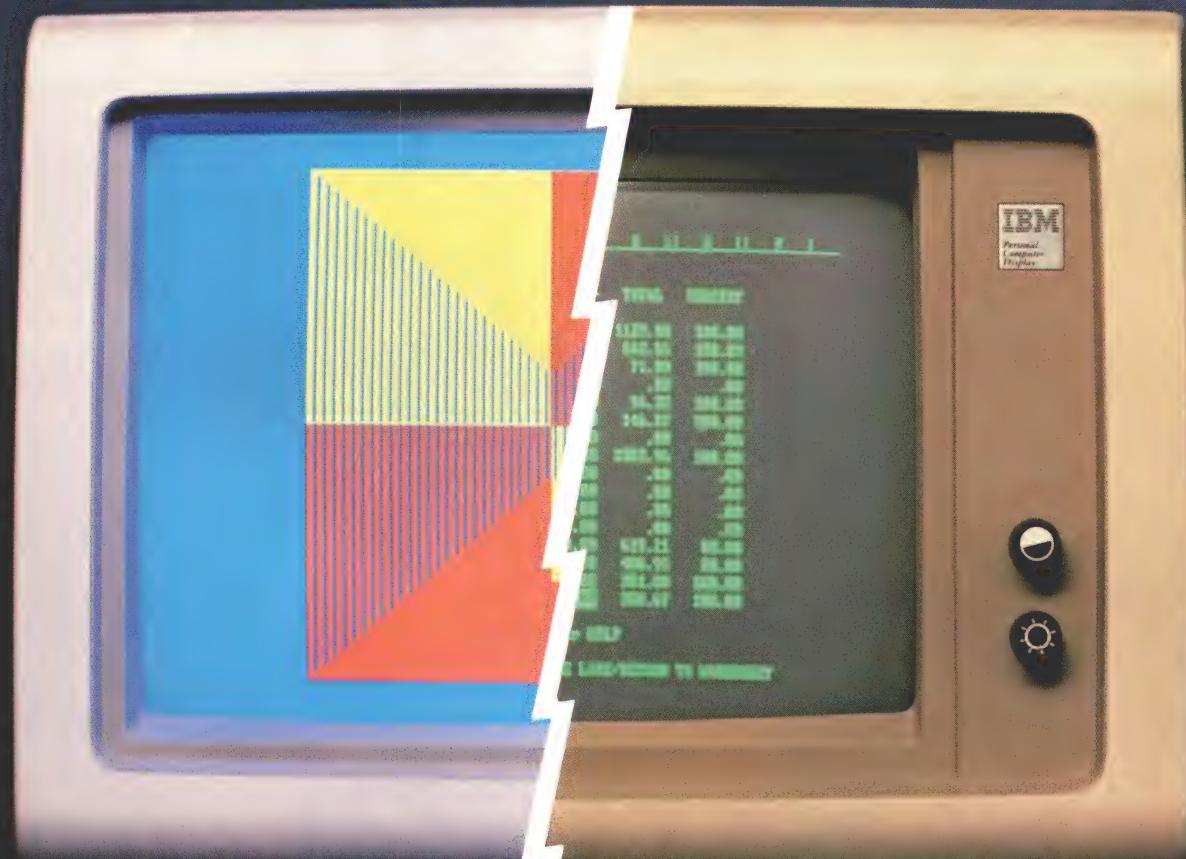


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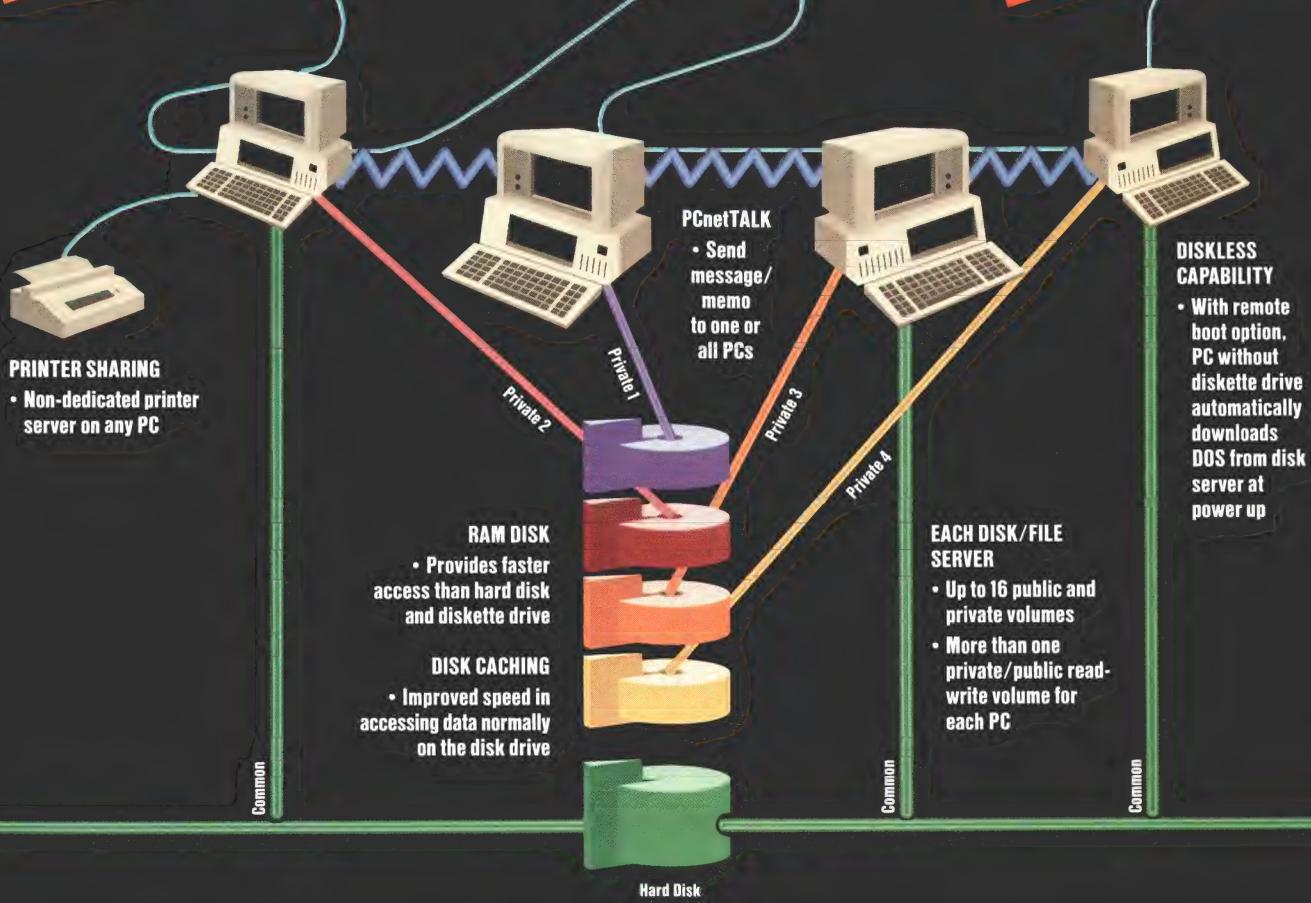
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Compaq Settles Down and Powers Up

Ken Greenberg

Compaq's second major product is the Deskpro, a high-performance PC-compatible desktop computer. Compaq's first product without a handle is much more than a clever marketing move. It shows that Compaq, the number-two seller of 16-bit computers, is serious about entering the competition for corporate desk tops—a move that puts this young, successful company in a head-to-head battle with IBM.

The Deskpro line includes four desktop computers, featuring modular pricing for modular components. For most users the Deskpro's salient qualities are storage, speed, and PC compatibility. For dealers the Deskpro line promises the same product flexibility as the PC itself. Each Deskpro unit includes space for four storage devices within the system unit, two to three times the processing power of the PC, a hefty power supply, and a predictable talent for running off-the-shelf PC software.

Gary Stimac, chief engineer for the product, says the Deskpro line was designed to take advantage of the increasing sophistication of both users and software. Within the personal computer business market, Compaq is aiming at both "power users"—those who seek the horsepower and the memory required to run such integrated, graphics-oriented packages as *Symphony* and *Framework*—and users with less ambitious computing needs.

Variations on a Theme

All Deskpro models are built from the same system unit, which includes an Intel 8086 microprocessor (a true 16-bit version of the PC's 8088), an 8087 socket, a 200-watt power supply, seven full-size expansion slots, and one short slot. Two of the full-size slots hold the floppy disk controller and video boards, both of which are standard equipment. The floppy disk controller board also contains a parallel printer port, while the video board supports RGB and composite color graphics displays. All

The Deskpro's salient qualities are storage, speed, and PC compatibility.

disk drives are half-height and shock mounted. The unit also sports a redesigned Key Tronic keyboard.

The Deskpro's detachable keyboard plugs into the front of the system unit. Unlike the Compaq portable's mushy keyboard, the Deskpro's keyboard has a snappy action and features lights on the <CapsLock> and <NumLock> keys. As with the portable, each <Ctrl>-<Alt>-<+> keystroke combination raises the volume of each key click; <Ctrl>-<Alt>-<-> reduces the volume.



The Deskpro, Compaq's modular machine

The Deskpro comes with three basic memory configurations installed on the system board: 128K RAM and 256K RAM—both using 64K RAM chips—and 640K RAM, relying on both 64K and 256K RAM chips.

The entry-level Deskpro, the Model 1, includes 128K RAM and one 5½-inch, double-sided, double-density, 360K floppy disk drive, leaving six slots available for expansion boards. Mike Swavely, marketing director for Compaq's new Office Computer Division, identifies the Model 1 as "the minimum configuration desirable for the business user, our target market." At press time Compaq's suggested retail price for the starter unit was \$2570.

The company is banking on the Model 2 to be its bread-and-butter desktop seller. This version comes equipped with 256K RAM, two floppy disk drives, and six free expansion slots. It lists for \$3170. Model 3, Compaq's PC XT equivalent, priced at \$5170, sports 256K RAM, one floppy disk drive, and a 10MB hard disk drive. The Model 3 also includes a hard disk controller board, which can accept a second hard disk drive, and a combination serial port and clock/calendar board in the short slot, leaving four full-size slots available for expansion.

At \$7370 the Model 4 is the Deskpro flagship. Boasting 640K RAM on the motherboard, it augments its single floppy disk drive with a 10MB hard disk drive and Compaq's 10MB Fixed Disk Backup, a tape backup system. The unit also includes the combination

serial port and clock/calendar board. The same controller board that can handle two floppy disk drives also controls the tape backup system—leaving four expansion slots free. While the company has no plans to promote the Model 4 heavily as a local area network file server, Compaq

President Rod Canion says such an application makes "ideal" use of the unit's speed and hard disk storage capacity.

Options for the Deskpro line include a 12-inch green or amber dual-mode (text and graphics) display for \$325, a tilt-and-swivel base for the monitor, and Desk Saver, a raised platform that lets you tuck the keyboard beneath the unit. MS-DOS 2.00 and Microsoft BASIC 2.1 are available, with reference manuals, for \$60. Compaq may eventually release an optional 20MB hard disk drive, which will be run by the same controller board as the 10MB hard disk.

Since each model is a variation on the same theme, Compaq has made upgrades from model to model easy for user and dealer alike. If you move from Model 2 or 3 to Model 4, however, you'll need to remove 18 64K RAM chips to make room for the Model 4's 256K memory chips.

State of the Art

Mike Swavely (left), flanked by engineer Gary Stimac, outlines Compaq's marketing strategy for PC World Editors Ken Greenberg (upper right) and Karl Koessel.



Two-Speed Compatibility

The Deskpro features a speed mode indicator light on the front of the system unit that tells you the current processing speed. When you're operating at the 7.14 MHz rate of the 8086, the light is green; a red light indicates that the machine is working at the 8088's 4.77 MHz rate. Pressing <Ctrl>-<Alt>-<\> at any time toggles the Deskpro's processor to the other speed. Most programs run two to three times faster when the Deskpro is running at 7.14 MHz.

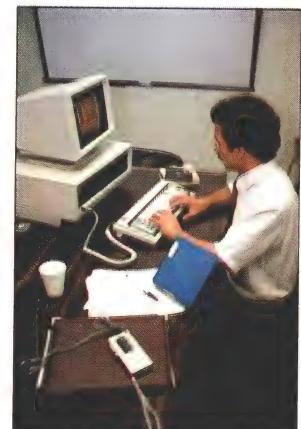
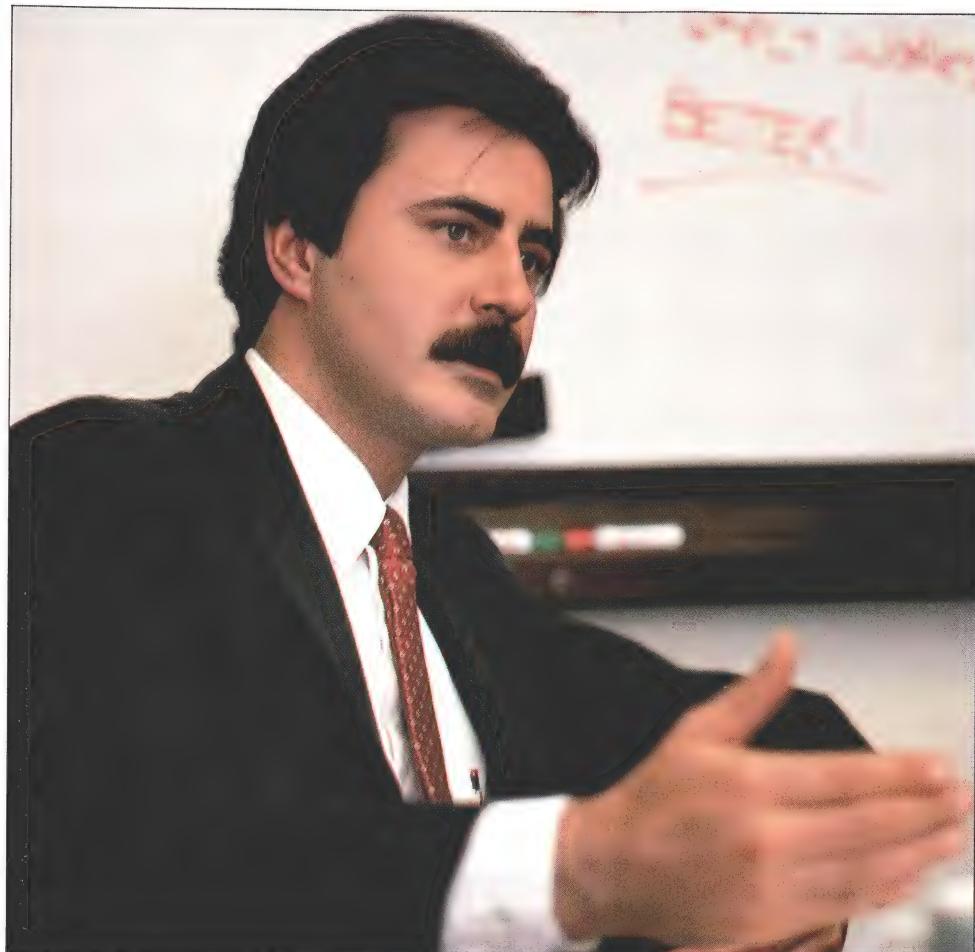
The Deskpro's BIOS ROM is an updated version of Compaq's original ROM—the source of its unparalleled PC compatibility—with speed-dependent routines corrected so that they run on both the 8086 and 8088 processors. The revised ROM will be installed in new Compaq and Compaq-Plus portables.

Chief Engineer Stimac describes the retention of Compaq's level of PC compatibility as an issue not subject to compromise. Stimac and his crew worked on ROM revisions in conjunction with a dozen major software developers, including Microsoft and Lotus Development Corporation. He acknowledges that the firm did "quite a bit of engineering" to get the 8086 microprocessor, which relies on a 16-bit data bus, to converse with expansion boards for the 8088, which uses an 8-bit bus. Compaq redesigned bus controllers to permit the 8086 to accept data from an 8-bit bus. According to Stimac, that means "full IBM PC board compatibility"—

in other words, the same 8-bit expansion boards that work in the Compaq portable also work in the Deskpro series.

While shifting into overdrive increases clock rate, compatibility doesn't depend solely on clock speed. The 8088 contains an internal 4-byte instruction queue, which is essentially a buffer that holds a sequence of instructions; the 8086 has a 6-byte queue. The bigger queue results in more efficient operation: because one call fills a queue, the 8086 spends less time retrieving instructions from RAM. Thus Stimac and his crew wrestled with—and apparently reconciled—the different execution times that arise from the different queue sizes. The result is an 8086 that fully emulates the 4.77 MHz 8088.

PC World tested a Deskpro prototype at Compaq's Houston headquarters. The machine booted up and ran PC-DOS 2.10, *WordStar*, and *Keynote* without a hitch. Version 1.0 of *1-2-3* ran flawlessly under DOS 1.10, while *Cosmic Crusaders*, which uses a timing-sensitive copy-protection scheme, loaded effortlessly. It ran in both speed modes, but at 7.14 MHz it overwhelmed Technical Editor Karl Koessel's lightning reflexes.



Technical Editor Karl Koessel begins a battery of tests on the Deskpro.

Mike Swavely, marketing director of Compaq's Office Computer Division, stresses the importance of the company's dealer network.



Compaq engineer Gary Stimac demonstrates the Deskpro's graphics capability.

The Modular Machine

Karl Koessel

The modular design of the Deskpro chassis and the availability of expansion boards, storage devices, and even RAM chips from Compaq dealers allow you to start small and expand the Deskpro computer system as your needs and expertise grow. Compaq has also structured the price of these components so that you end up paying the same amount for the Deskpro and added upgrades as you would have paid if you had bought them all at once. Although Compaq is promoting the Deskpro as four differently configured models, it can be customized to your particular needs using either Compaq or third-party expansion options.

The Deskpro chassis has four identical half-height compartments for mass storage devices. This means that a Compaq half-height floppy disk drive, hard disk drive, or tape backup system can be mounted in any of the compartments. Thus, the Deskpro can hold two floppy disk drives, a hard disk, and a tape backup system all in the same system unit—without any external cabinets, power supplies, or cables. In contrast, IBM offers only full-height floppy and hard disk drives for the PC's two full-height compartments.

Expansion Options

In addition to the standard 128K of RAM, the system board of the entry-level Deskpro includes 18 empty memory chip sockets (as does a 128K Compaq, PC, or XT). The architecture of the Deskpro requires that you fill all of these sockets when adding memory to the system board. Since either 64-kilobit or 256-kilobit RAM chips may be used, filling these sockets boosts the entry-level model's memory to either 256K or 640K. Third-party memory expansion boards may also be used to increase the Deskpro's RAM.

The memory sockets of the Deskpro Models 2 and 3 come filled with 64-kilobit RAM chips. If you opt to increase memory by using 256K chips on the system board rather than by installing a memory board in an expansion slot, these chips must be removed.

Adding another half-height floppy disk drive to the Deskpro is a snap. You can install it yourself or have your Compaq dealer do it. The cable from the disk controller board to the first floppy disk drive has the connector for the second drive. You open the Deskpro chassis, slip a shock-mounted floppy disk drive into one of the compartments, tighten one screw to secure it, push the floppy disk controller board cable's connector onto the drive, flip a tiny switch on the system board, and close the chassis.

The 10MB half-height hard disk for the Deskpro is the same uniquely shock-mounted hard disk that is used in the Compaq-Plus (see "COMPAQ Gets a 10," *PCW*, Vol. 2, No. 2). Upgrading the Deskpro Models 1 and 2 with a hard disk takes only a few more minutes than adding the second floppy disk drive. In addition to the same basic installation procedure for all Deskpro mass storage devices, the hard disk controller board must also be installed in one of the expansion slots. The hard disk controller board and its cable can support two hard disks.

Anyone who has used BACKUP to store hard disk files on floppy disks will rejoice in the simplicity of the Deskpro's Fixed Disk Drive Backup, a removable tape cartridge backup system. The DC 1000 tape cartridge uses high-density tape in a $\frac{1}{2}$ -inch by $\frac{3}{4}$ -inch by $2\frac{1}{2}$ -inch cartridge. You can back up selected files or the entire 10MB hard disk (which takes about 15 minutes) without the laborious chore of swapping floppies in and out of the drive. (Before files are backed up onto tape, the tape must be formatted, a one-time process that takes about 40 minutes.) And unlike the files created by the BACKUP command (these files cannot be used unless transferred back to a hard disk using the RESTORE command), the files generated by the tape backup system can be restored to floppy disks in a usable format. So if the hard disk is in the repair shop, you can use the hard disk files backed up on the tape system.

Installing the Fixed Disk Drive Backup is as simple as adding a second floppy disk drive or a hard disk drive. The tape unit fits in any of the



Engineer Gary Stimac displays a cartridge from the Fixed Disk Drive Backup unit.

Deskpro's four mass storage device compartments and is secured with one screw. The same cable that connects the two floppy disk drives to the controller board includes the connector for the tape drive. By using the same controller board for the floppy disk drives and the tape drive, Compaq gives removable tape backup to the Deskpro without using an additional expansion slot.

Included in Models 3 and 4 is Compaq's combination serial port and clock/calendar board, which fits in the Deskpro's single short slot and is

available as an upgrade option for Models 1 and 2. This board contains a PC-standard asynchronous serial port (RS-232C or current-loop operation), configurable as COM1: or COM2:; and a National Semiconductor clock/calendar chip (MM58167A). The clock may be disabled, and its battery is recharged when the Deskpro is on. Although a third-party expansion board with a clock/calendar may be installed in the Deskpro, the new Compaq ROM will, if Compaq's clock/calendar (or another clock utilizing the MM58167A) is present, automatically set the system date and time.

State of the Art

From Development to Desktop

Compaq officials maintain that the introduction of the desktop line was not a direct response to IBM's release of the Portable PC in February of this year. Planning for the Deskpro began in October 1983, but the project didn't leave the drawing board until January of this year. Compaq then lit a fire under its engineers, who produced a prototype in less than five months.

With the Deskpro, Compaq has applied current, but not untested, technology. The company considered and rejected machines based on Intel's 80186 and 80286 16-bit superchips. "The additional functionality of the 80186 wasn't PC-compatible," Stimac explains, while the scarcity of the 80286 precluded use of that chip for the Deskpro line. The company also vetoed production of a lap-size portable with built-in software, similar to Hewlett-Packard's recently announced machine. Compaq's marketing experts felt that such a product, which lacks the Deskpro's expansion capabilities, was too limited to appeal to the broad PC market.

Although not specifying the sources of the Deskpro's components, Marketing Director Swavely confirms that Compaq has locked up sufficient supplies of 8086 microprocessors and key subassemblies, including the 256K RAM chips. "We are getting an inordinate amount of capacity from some vendors," he says. One component Compaq can't get its hands on is a number-crunching 7.14 MHz 8087 chip, which Intel has not yet produced in volume. "We're really not selling this product on the basis of speed, since that is only one aspect of it," Swavely notes. "Our overall pitch is based on this being a better PC."

A Deal for Dealers

Relying on an 8086 chip may affect user perceptions of PC compatibility. For that reason H. L. Sparks, Compaq's vice president of marketing, says that Compaq will talk more about performance than processors. "Volume buyers could care less about what's inside, as long as it runs useful software," he notes.

Compaq's success, as the company often acknowledges, is due almost as much to its relationships with its 1350 dealers as to the quality of its computers. That successful formula stands unaltered with the Deskpro. Compaq is holding fast, for example, to its strategy of not competing with its dealers. Unlike IBM, the company doesn't have its own sales force or product centers. And according to Sparks and Swavely, the new product line is just what dealers asked for.

Room to Grow

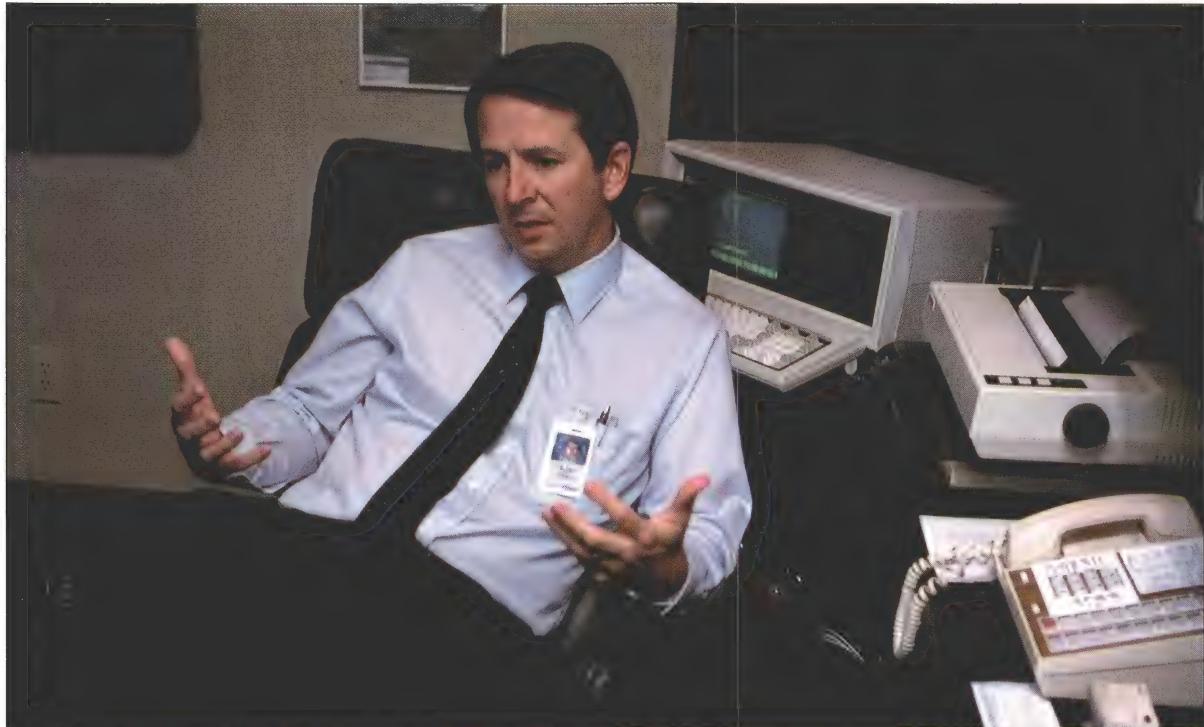
With the introduction of its Deskpro line of desktop computers, Compaq has taken a giant step toward becoming a major force in the personal computer market. But the Deskpro announcement is best seen against the backdrop of a company experiencing unprecedented growth that it now seeks to direct.

In the space of one week last spring, Compaq expanded its operations to Europe, created a telecommunications subsidiary, and announced twin marketing efforts aimed at corporations and educational institutions. The most significant new development, however, was Compaq's reorganization into Portable Computer, Office Computer, and Advanced Computer divisions—a move designed to keep the firm nimble and responsive to changes in the market, according to Compaq President Rod Canion.

These changes confirm Compaq's intention to become a force in the business computer market. Canion reports that the company's new Dallas-based telecommunications offshoot is already working on a new product. While mum on future products, Canion and several other company officials acknowledge that Compaq's popular 8088-based portable may eventually be enhanced—or replaced—with the Deskpro's 8086 technology. At the present time Compaq has no plans to enter the applications software market.

Meanwhile, the company's growth continues. Compaq's first-quarter earnings for 1984 were \$3.3 million on sales of \$63 million—nearly matching the firm's income for all of 1983. Total 1983 sales exceeded \$111 million, which Compaq claims is a first-year record in American business. Since its formation in 1983, the firm has expanded its payroll from 3 to more than 850.

Currently scattered at six sites throughout sprawling Houston, Compaq has begun construction on a nine-building corporate complex that will house all the company's divisions. Even Compaq's new quality-control program suggests that the firm is now a "major player." Vendors who supply defect-free products are rewarded with continued Compaq business.



Compaq president Rod Canion affirms his company's need to adhere to the PC standard.

Compaq is pouring more of its energies and money into marketing. The Compaq Portable and the Compaq-Plus are already appearing in computer specialty stores throughout Germany, Great Britain, and Canada. The company has also stepped up its domestic marketing efforts, initiating "Compaq in Major Accounts" and "Compaq in Schools" programs. Both incentive programs rely on Compaq's network of 1350 authorized dealers and are administered through the firm's new regional sales offices. Compaq is targeting secondary schools as well as colleges and universities. In the corporate arena the company is offering increased on-site sales, training, and service.

By maintaining near-perfect PC compatibility in the Deskpro product line, Canion has unequivocally cast Compaq's lot with the personal

computer industry's current standard, set by IBM. Fortune magazine recently declared that Compaq's "greatest asset"—PC compatibility—may also be its greatest liability, should IBM opt for a new standard. But Canion is convinced that PC incompatibility is by far the greater risk in today's market.

Canion suggests that the standard has achieved a momentum of its own, saying, "The standard is pervasive, and this, along with marketing considerations, dictates that IBM adhere to it. If a new standard comes out—which only several companies in the industry can really introduce—we will follow that."

As far as Canion is concerned, the new standard isn't likely to be a multiuser operating system, such as AT&T's UNIX. "UNIX is outside the PC marketplace—it is not a force just because the PC can run it. The PC marketplace is a separate, dynamic entity with a life of its own."

State of the Art

"We're concerned about our dealer base," Swavely says. "For them shelf space is the issue. The Deskpro minimizes the number of units a dealer must stock, yet enables [dealers] to support the full product line." Configuring the machine to a buyer's specifications is a quick, simple matter. Indeed, economizing on space may be especially critical now that new Apple and IBM products are jamming dealers' shelves. (See "The Modular Machine.")

The Deskpro line, according to Sparks, "offers a growth path without the threat of obsolescence. With the Deskpro, we actually changed our pricing picture so the whole could equal the sum of the parts—for the end user and the dealer alike." Compaq began shipments of the Deskpro to its highest-volume dealers in late June, and the machines were released in quantity several weeks later.

The Deskpro represents the first product from Compaq's Office Computer Division, but company president Canion confirms that new offerings are on the way from the company's recently formed Advanced Computer Division and Dallas-based telecommunications subsidiary. (See "Room to Grow.")

Releasing a family of desktop computers underscores Compaq's intent to compete with IBM, but the old symbiosis in the Texas upstart's relationship with Big Blue remains. For openers, virtually all Compaq dealers

also carry the PC—and that's the way Canion likes it. "We're armed for an environment that assumes a complete supply of PCs and XTs," he says. "We're assuming that so we aren't identified as a stopgap product."

"Last year we won the battle for shelf space," he continues. "Poor distribution is the error that kills machines every bit as much as design flaws. Now we're making a statement as a long-term company and answering those who ask, 'Can they do it again?'" ●

Ken Greenberg is an Assistant Editor of PC World.

Deskpro

Compaq Computer Corporation
20333 FM 149
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List price: Model 1 \$2570, Model 2 \$3170, Model 3 \$5170, Model 4 \$7370, MS-DOS 2.00 and BASIC 2.1 (include manuals and disk) \$60, 128K RAM kit \$170, 512K RAM kit \$1295, disk drive option \$430, fixed disk drive upgrade kit (includes controller board and cable) \$2280, fixed disk drive backup \$1075, serial interface/clock board option \$50, 12-inch dual-mode monitor (green or amber display) \$325, monitor tilt and swivel option \$50, Desk Saver \$50

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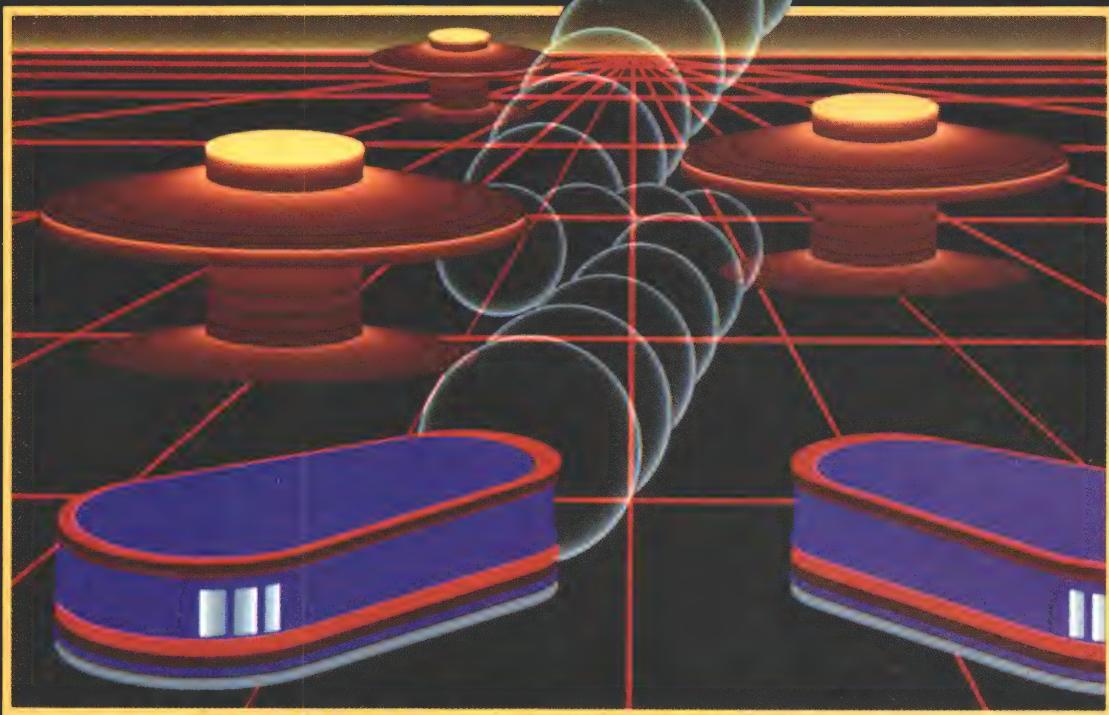
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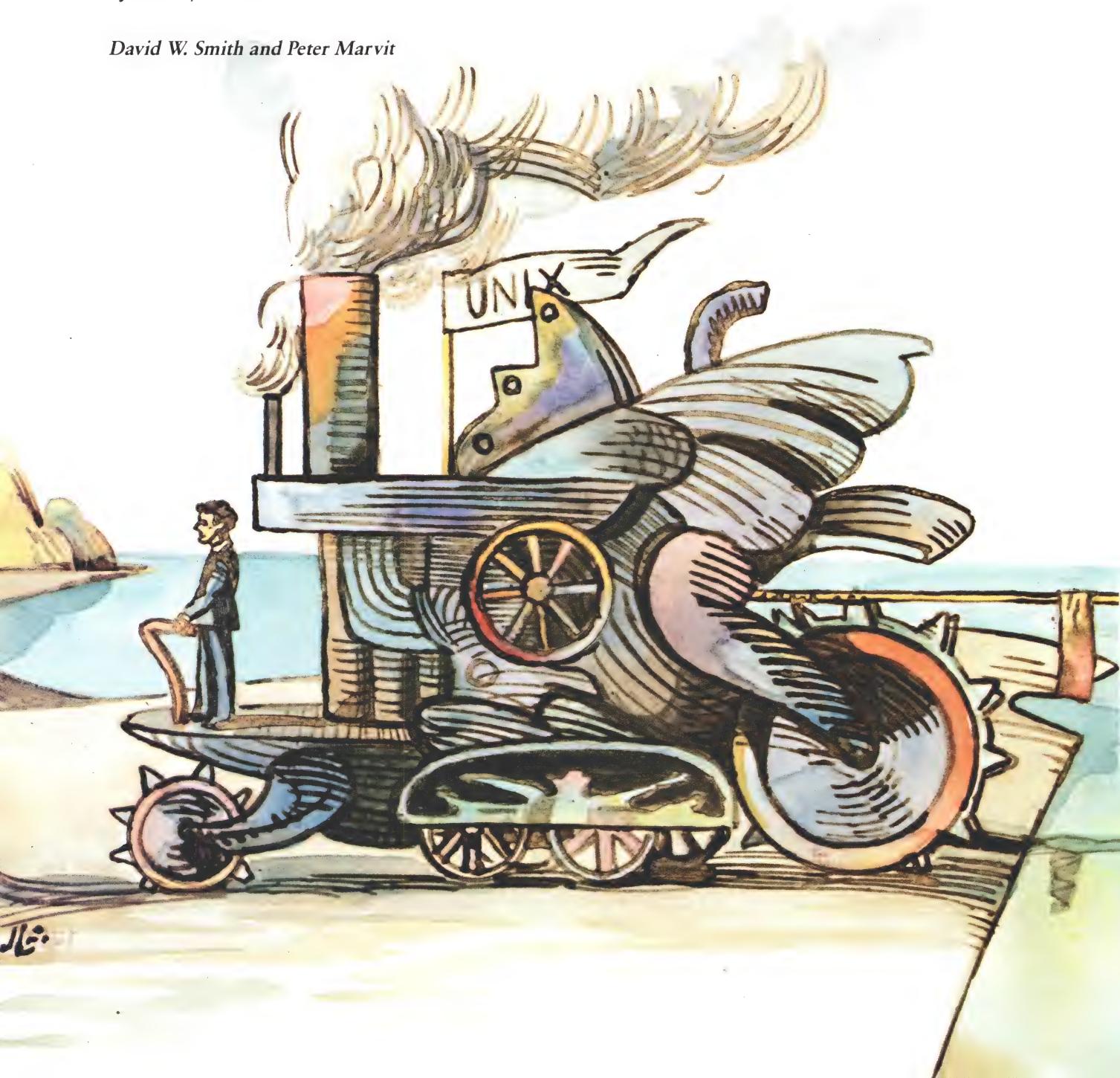
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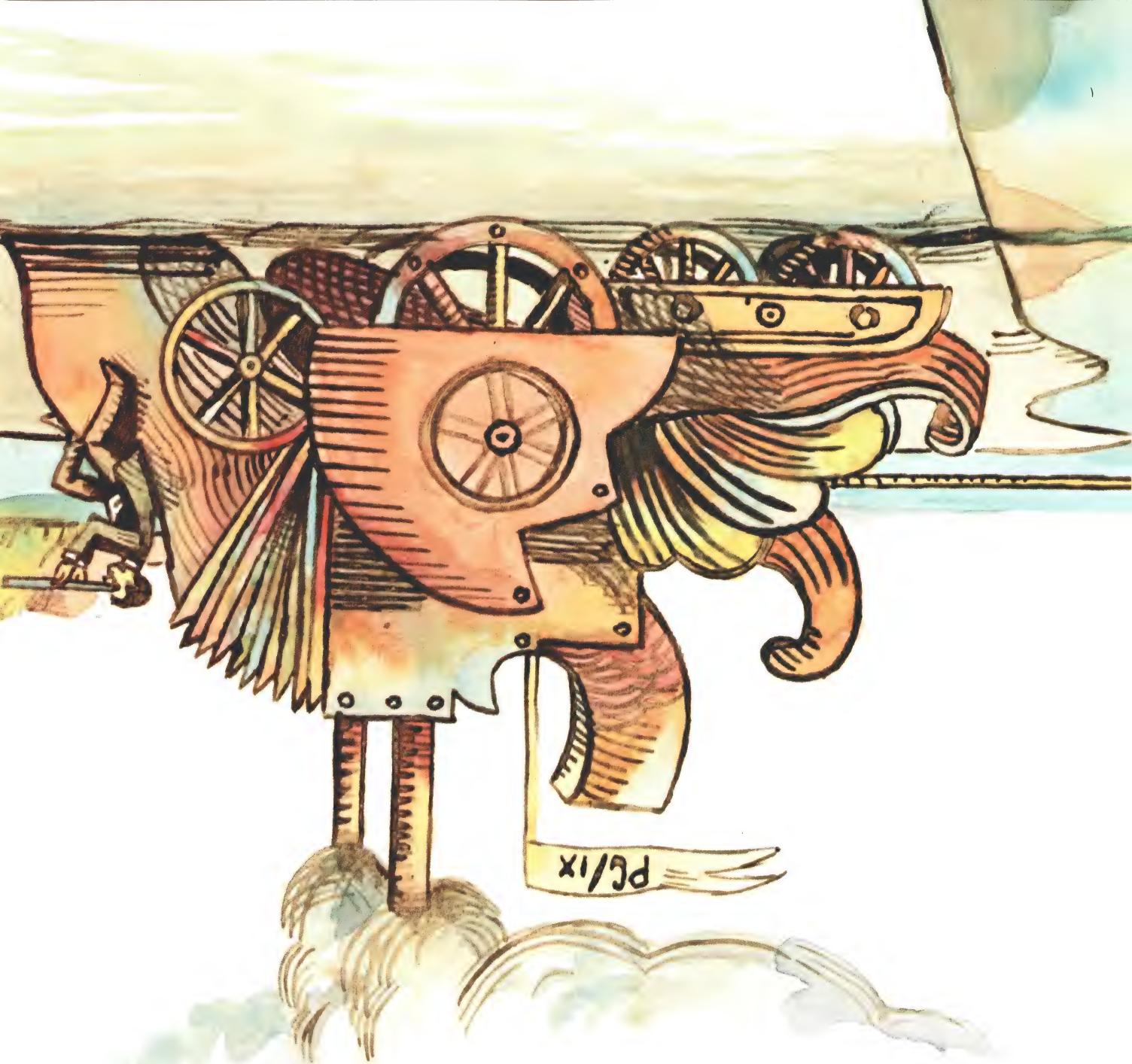


UNIX Tug-of-War

IBM got into the fragmented personal computer business late and ended up dominating the market. But this time IBM is taking on a giant—namely AT&T—with PC/IX, a UNIX operating system for the PC.

David W. Smith and Peter Marvit





● State of the Art



When people talk about UNIX, their voices are tinged with awe as they extol the virtues and complexity of this Bell Labs creation. UNIX is often called the ultimate in operating systems; it is both powerful and portable. Unfortunately, it is also cryptic, which is not surprising, considering that UNIX was developed for large, powerful computers and the programmers who use them.

UNIX is popular with users of large computers because it admirably handles the chore of simultaneously serving a number of users linked to a single machine. For software developers UNIX provides a powerful set of tools that ease the task of programming. A program created in the UNIX environment is not only powerful but works on many machines that support UNIX, including the PC. Though the PC is designed to serve only one user, with PC/IX it can run several tasks simultaneously. Most important, with PC/IX you can use many existing UNIX applications and develop new ones on the PC.

Waiting for PC/IX

PC/IX (Personal Computer Interactive Executive) is derived from Bell Laboratories' System III UNIX and was developed for IBM by Interactive Systems. IBM's inclusion of UNIX in

its official product line puts it squarely in the path of the AT&T juggernaut, which is trying to establish its System V UNIX as the industry standard, and raises a couple of questions. Will PC/IX compete with DOS for a share of the PC pie? Will there be UNIX support for other IBM machines? Many retailers were initially confused after IBM announced PC/IX; one Silicon Valley PC dealer thought that PC/IX ran only on the XT/370.

Now that the smoke has cleared, it's evident that PC/IX is not fighting for the turf held by DOS. It's also clear that PC/IX is not for the masses—it carries a hefty \$900 price tag, requires an XT or a PC with a

PC/IX is not fighting for the turf held by DOS.

hard disk, and will not be available through retail outlets for some time. IBM is targeting Fortune 2000 companies as the PC/IX market through its national sales and marketing divisions.

Even though PC/IX is not competing head-to-head with DOS, it is curious that IBM chose Interactive Systems rather than Microsoft to develop its version of UNIX. Microsoft's XENIX operating system for the PC is based on System III UNIX and would at first glance seem the natural upgrade for an MS-DOS user anxious for UNIX. Many of the enhancements that Microsoft introduced in MS-DOS 2.00, such as the

tree-structured file system and I/O (input/output) redirection, came from XENIX (and thus from UNIX). MS-DOS 2.00 even includes a number of XENIX-compatible system calls.

IBM chooses small companies as suppliers because by doing so it can control product supply and thus the market. Had IBM chosen Microsoft, it would have put two precious eggs—both of the PC's official operating systems—in the same basket. With PC/IX, IBM also enters the UNIX fray with a seasoned product. Since its founding in 1977, Interactive Systems has been involved with UNIX but has kept a relatively low profile. In addition to developing PC/IX, Interactive Systems is rumored to be working on a version of UNIX for IBM's 4300 series mainframes. The question of who will develop a version of UNIX for future PCs—particularly those based on Intel's true multitasking 80286 microprocessor—is still unanswered.

PC/IX

PC/IX is a surprisingly rich implementation of UNIX, and it contains enhancements specifically for the PC. It also includes programs seldom found on personal computers. One of the most important is SCCS (Source Code Control System), a set of programs that maintains an audit trail file of changes made to programs or documents. This historical information serves as a backup to documentation and is particularly useful when a number of programmers work on one project. PC/IX also includes uucp, an electronic mail and communications program that automatically handles file transfers between UNIX systems.

Although PC/IX is a complete and, thankfully, relatively fast UNIX implementation, it lacks some of the "Berkeley enhancements," from UNIX's early days in academia, that

are finding their way into the popular System V UNIX being pushed by AT&T. One big omission in PC/IX is the C-shell, a programmable command interpreter included in most versions of UNIX. Programming DOS's command interpreter, COMMAND.COM, is a two-step process, since you must first write a batch file and then execute it. With a UNIX C-shell, you simply type commands directly into the command interpreter. Aside from this, a seasoned UNIX user won't find much missing in this package. Even a brief hands-on session with a preliminary version of PC/IX confirms that it is a reasonable and credible implementation of UNIX on the PC.

The PC/IX Environment

The only high-level language included with the first release of PC/IX is C. The compiler is based on Bell's Portable C Compiler (the basis of many commercial C compilers) and includes a code optimizer specially crafted by Interactive Systems for the PC's 8088 microprocessor. Also included are an assembler (as), which, like ASM, converts assembly lan-

guage mnemonics into object code; a relocating loader (ld), which, like LINK, ties object code modules together; and a symbolic debugger (adb), which reduces the drudgery of debugging by representing object code with symbols.

In addition to the standard UNIX editor, ed (which many consider less palatable than EDLIN since it has no prompts and responds with cryptic error messages), PC/IX provides a multiple-window editor called INed. INed will display multiple files or several parts of a file in different windows; thus you can refer to other sections of code while you are in the middle of writing a program, compare two word processing files, or use several applications simultaneously. Menus and help screens are also part of the editor.

Shell commands, such as sort or spell, can also be executed from within INed. For example, you could edit a text file containing a table of unalphabetized names, quickly write the table to disk, and have it sorted and read back into the text without leaving the editor. The same process using DOS and a text editor would involve copying the table into a disk file, exiting the editor, loading a sort utility and creating a new sorted file, loading the editor again, and reading the sorted table into the text—a lengthy, multiple-step process that PC/IX avoids.

Multitasking

Although PC/IX cannot juggle several users at once, it can hold several programs in memory at the same time and execute them concurrently, with the output from one program serving as input for another. This multitasking can be illustrated by constructing a sorted list of all 1977 wines from a text file containing a wine list. When you issue the command `grep 1977 < winelist | sort`, PC/IX uses filters to create the sorted list. Filters in PC/IX, like those in DOS 2.00 and 2.10, read input, alter it, and pass it along to another utility.

The PC/IX command interpreter—also called the shell—reads the command sort and invokes grep. Grep is similar to the DOS FIND utility, though it can locate character strings

containing wild cards. The single argument 1977 is then passed to grep. The shell arranges for the input to grep to come from the file winelist and for the output from grep to become the input to sort. Because no output path was specified for sort, the shell directs the output to the screen. At this point grep and sort are in memory and executing concurrently.

DOS is not a multitasking operating system, and thus only one program can be resident in memory and executing at any given time (something that Microsoft promises to change with MS-DOS 3.00). The DOS command `FIND "1977" < WINELIST | SORT` produces the same results as the PC/IX command above, but it takes longer. Because FIND and SORT cannot occupy memory at the same time, DOS's command interpreter will break the command into two steps. First the output from FIND will be redirected into a temporary disk file, which will serve as input to SORT. The entire process is slow and requires additional disk space.

PC/IX's multitasking power also lends itself to local area networks. When a PC XT is a network server, its resources—RAM, a hard disk, and attached peripherals—are dedicated to the PCs in the network. The server cannot normally be used as a work station, but if network soft-

A seasoned UNIX user won't find much missing in PC/IX.

guage mnemonics into object code; a relocating loader (ld), which, like LINK, ties object code modules together; and a symbolic debugger (adb), which reduces the drudgery of debugging by representing object code with symbols.

In addition to the standard UNIX editor, ed (which many consider less palatable than EDLIN since it has no prompts and responds with cryptic error messages), PC/IX provides a



State of the Art

Feature	PC-DOS 2.00	PC/IX
Single user	Yes	Yes
Multitasking	No	Yes ¹
Password required?	No	Yes
Tree-structured file system	Yes ²	Yes
I/O redirection	Yes	Yes
Printer spooling	Yes	Yes
Line editor	Yes	Yes
Screen editor	No	Yes
BASIC	Yes	No
Compilers	No	Yes
Assembler	No	Yes
Linker	Yes	Yes
Debugger	Yes	Yes
Memory requirements	64K	256K
Drive requirements	1 single-sided disk drive	10MB hard disk and 1 double-sided disk drive
Price	\$60	\$900

¹Disk files are "owned" by a given user and may be protected from being read or written to by other users.
²Pipes are implemented with files.

Table 1: DOS 2.00 and PC/IX features

ware companies take advantage of PC/IX's multitasking abilities, a PC XT could easily satisfy a small network's needs while still functioning as a stand-alone computer.

PC/IX and DOS

PC/IX will happily coexist with other operating systems on the same hard disk, provided that each has separate, dedicated partitions. This ability to share a hard disk with other operating systems is a marketing plus for PC/IX, since it spares hard disk users from forsaking their DOS applications. PC/IX and DOS are particularly good neighbors, since utilities provided with PC/IX transfer data

files between a DOS 2.00 disk or fixed disk partition and the PC/IX file system. Once files are in the PC/IX file system, no file conversion is necessary; PC/IX and DOS are essentially data-compatible. Of course, only one operating system may be active at a time.

When comparing PC/IX and DOS (see Table 1), keep in mind that PC/IX is a complete, ready-to-go development environment. With DOS you are forced to shop for additional software before beginning any serious programming. PC/IX, however, comes with a full-screen editor, a C compiler, an assembler and a linker, and a full set of utilities, including telecommunications programs. The cost of all these extras for DOS would easily exceed PC/IX's \$900 price tag.

Hardware Requirements

PC/IX comes on 19 double-sided disks and occupies 6MB on the 10MB disk, though this can be reduced to about 3MB after nonessential or infrequently used utilities are removed. PC/IX also supports a second hard disk and four single- or double-sided disk drives, plus two serial and two parallel ports. PC/IX requires a minimum of 256K RAM, though IBM recommends at least 512K for a multitasking environment.

PC/IX supports the 8087 numeric coprocessor in a novel and effective way. If an 8087 is not installed in the PC, applications that use floating-

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State of the Art

point calculations are serviced by special floating-point emulation code in PC/IX that is accessed by a special "trap" in the application. If an 8087 is present, PC/IX replaces this trap with an instruction to access the 8087 directly on subsequent executions.

UNIX and the 8088

The PC's 8088 microprocessor can address 1MB of memory, but it cannot effectively manage and protect that memory in a multitasking environment. When several programs are active under PC/IX at once, it is difficult to prevent one from inadvertently writing into memory reserved or "owned" by another. This has two important potential results: the system may crash when an errant program destroys another program or PC/IX, or if a program needs more memory, PC/IX may have to shift other programs next to it in memory to make room—a difficult and time-consuming process. Both of these problems would be alleviated by memory-management hardware, which the 8088, and hence the PC, lacks.

If and when IBM releases an 80286-based machine, memory-management and protection problems will certainly fade. Many industry observers feel that UNIX in any form requires at least the power of the 80286 to run well on a small machine. Not surprisingly, Digital Research is working with Intel to develop a UNIX System V for the 80286, and Microsoft is working on XENIX-286.

A UNIX in Your Future

Don't expect to walk into a ComputerLand and find a copy of PC/IX—at least not for a while. IBM is not selling the operating system through its national accounts by accident; PC/IX is aimed at those Fortune 2000 corporations that do in-house programming or, like Visi-Corp, create software for a living. PC/IX makes the PC more appealing to those who use UNIX on larger systems, because it draws the PC into the development process. A PC using PC/IX can not only run many UNIX applications but develop them as well.

Nevertheless, some UNIX users are taking a "wait-and-see" attitude towards PC/IX, and with good reason. AT&T's System V UNIX is used on many large systems; AT&T has already entered the minicomputer and personal computer markets with a series of 32-bit machines running this version of UNIX. Unless third-party applications arrive soon, PC/IX may have difficulty establishing itself as a small-systems UNIX standard. Though IBM's name on any product is usually a guarantee of success, IBM may yet dance to AT&T's tune. ■

David W. Smith is a software engineer for Tolerant Systems of San Jose, where he works with the UNIX programming environment. Peter Marvit is an industry analyst for Yates Ventures of Los Altos, California, where he follows developments in the UNIX world.

PC/IX

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Compatibles Update

New and notable developments in the world of PC work-alikes

Ken Greenberg

Compatibles Update keeps tabs on the changing and growing market of personal computers that emulate the IBM PC standard. The column features news on hardware and software developments as well as insights into the legal and marketing issues that affect compatibility. *Compatibles Update* also goes behind the headlines and talks to the newsmakers and movers who guide this roller-coaster industry.

Computers

Meet Me at Mitsubishi

Take one venerable American computer maker, add an aggressive new hardware and software company, toss in a Japanese manufacturing conglomerate, stir gently—and out comes one machine sporting two logos.

That's roughly the recipe for the computers manufactured by Sperry Corporation, Leading Edge Products, and Mitsubishi of Japan. Both American concerns subcontracted with Mitsubishi to produce a PC compatible based on Intel's 8088-2 processor chip. Sperry and Leading Edge claim their machines are faster than the PC, offer enhanced color and graphics, can be hooked up to mainframes, and cost less than the PC.

Sperry and Leading Edge agree that their system units are identical down to the ROM. But that's where the similarity ends. The keyboards and monitors differ—and the marketing plans of the two companies diverge decisively. Sperry relied on Key Tronic for its keyboard and Mit-



The Sperry PC (top) and Leading Edge PC share a Mitsubishi system box, but marketing strategies for the machines are worlds apart.

subishi for its monitor. Leading Edge went to a Gulf and Western subsidiary for a keyboard that duplicates the PC's and opted for an N. V. Philips monochrome monitor.

According to Leading Edge VP Geoff Burr, his firm provided the impetus behind the Mitsubishi machine. "We went into the manufacturing marketplace with detailed specifications for a product we wanted built," he said. "We designed it."

But with Sperry handling its own marketing and distribution, you're not apt to see Sperry and Leading Edge computers sharing the same shelf at your local retailer's. Sperry product manager Mike McNulty identified his company's target audience as the "professional PC user" who extends workday applications into the home. Sperry is aiming for Fortune 2000 companies and selected retail outlets, with emphasis on the former.

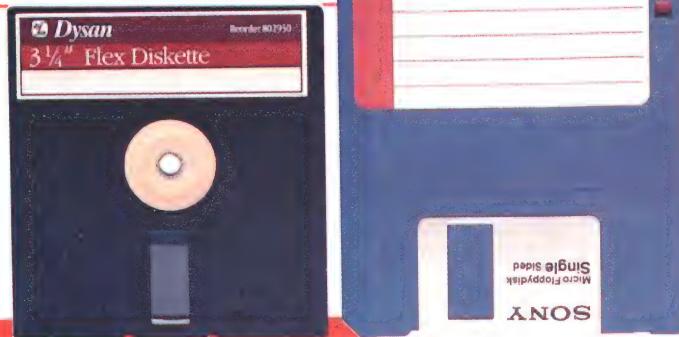
"Sperry has a systems solution approach," McNulty said. "The Sperry PC can be hooked up to anybody's mainframe—hopefully Sperry's. We feel we're extending the power of the data processing world to the desktop."

Sperry's strategy is to use its PC to secure its mainframe base and thus counter the practice of hooking up IBM PCs to Sperry mainframes. By becoming more visible on desktops, the Sperry PC will remind users of the company's installed mainframes—or so Sperry hopes.

As a sales incentive Sperry recently began bundling its computer with Fox & Geller software, including three *dBASE II* enhancement programs—*Quickcode*, *dUTIL*, and *dGRAPH*—plus *Grafox*, a menu-driven graphics program, and *OZ: Management Control*, a financial management program.

Leading Edge's Burr put it bluntly: "We're looking at totally different marketplaces," he said. "Leading Edge is marketing to 6000 computer retail specialty stores, plus small- and medium-size systems and software houses."

Small, smaller, smallest: the 3½-inch microfloppy disk (far left) is challenging 3½-inch and 5¼-inch floppies for status as a standard.



While neither company admits the existence of a marketing agreement, Burr said there is a pact governing production and that Leading Edge is currently entitled to a "considerably" higher percentage of units produced. "We're not really competing. Our pricing is lower, our margins are lower—and to meet demand, we will need a lot more units than we first thought."

The Medium Is the Message

With Sony, Apple, and Hewlett-Packard going to bat for 3½-inch disk drives, it's no surprise to see this alternative to the 5¼-inch standard becoming popular with users and manufacturers. But an even smaller upstart may give the 3½ a bit of a tussle.

Seequa Computer, manufacturer of the inexpensive Chameleon compatible, has joined forces with Dysan and

One thing both firms share is an inauspicious product debut. Both had to cope with a potentially defective power supply in early shipments from Mitsubishi. In February Leading Edge recalled its first 1170 units, while Sperry—which had relatively few machines in user's hands—dispatched field engineers, primarily to demonstration sites and corporate users. Burr reported that 100 percent of the Leading Edge units were repaired within weeks of the recall.

Tabor to produce the portable Seequa 325. The number 325 refers to the computer's dual Tabor 3.25-inch drives, capable of storing 360K each. The Seequa is the first machine so equipped. The 325 features dual 8088 and Z80 processors, 128K of RAM, a PC-style keyboard, a 9-inch green phosphor monitor, color and black-and-white graphics capabilities, and serial and parallel ports.

Seequa hasn't forgotten software for these unconventional microfloppy drives. Included for the computer's \$2495 list price are MS-DOS 2.00,



Perfect Writer, Perfect Calc, Perfect Speller, GW BASIC, and C-Term. Also available are such standards as *WordStar, Multiplan, and SuperCalc*.

Unlike 3½-inch disks, which are encased in a hard plastic sleeve, 3¼-inch disks, like their 5½-inch and 8-inch brethren, are flexible. Dysan officials claim that the 3¼-inch disks are compatible with the standard 5¼-inch disk data format. Data can be copied onto a 3¼-inch disk by plug-

Compatibles Update

ging both drives into the same machine—something you can't do with 3½-inch disks, Dysan contends. A Seequa spokesperson said the move to 3¼-inch drives was made because of their "reliability and compactness.... We believe these drives represent state-of-the-art technology," he said. "They offer greater portability and protection from contamination" than the current standard.

One industry source suggested Tabor and Dysan were interested in introducing the new disk drives immediately, amid the confusion produced by several conflicting technologies for the 3½-inch drive. The firms are betting that the introduction of a single 3¼-inch drive—produced domestically—will eventually lure the industry to coalesce around that standard.

Zenith Adds Five Compatibles

Claiming that its new machines "go beyond" IBM PC compatibility, Zenith Data Systems has begun marketing five personal computers: three Z-150 desktops and two Z-160 portables, sporting different disk drive configurations. All feature Intel's 8088 microprocessor, 128K of RAM expandable to 640K, two RS-232C serial ports, one Centronics-compatible parallel port, RGBI color output, composite monochrome output, an IBM expansion bus with four slots, and a detachable keyboard. All machines come with a tutorial audio tape.

The desktop models come in three disk drive configurations: a single half-height 5¼-inch floppy drive,



Zenith's Z-160 PC compatible portable features a unique top-loading floppy disk drive housing.

dual half-height 5¼-inch floppy drives, and a system with one half-height floppy drive and a 10.6MB hard disk. The portable comes with either one or two half-height floppy disk drives mounted within a hinged box that occupies the rear three-quarters of the top of the portable. The box flips up when the machine is in use. Both portables weigh 30 pounds and include 9-inch amber monitors. Monitors are not standard equipment for the desktop models. The portables cost \$200 more than the desktops.

To bolster its claim of hardware and software compatibility, Zenith has reported testing "dozens" of PC expansion boards and more than 175 software programs written for the PC, including 1-2-3 and *Flight Simulator*. "We ran them right out of the box without any modification," says Zenith Data Systems president Donald Moffet. Zenith marketing vice president John Frank explained that the company is seeking to surpass the IBM standard by offering features not found on the PC or most compatibles.

Among those features is a redesigned keyboard that boasts an enlarged, L-shaped <Enter> key, a double-width <Shift> key, and English-language key legends; the keyboard remains functionally identical to the PC's, however. Built-in, menu-driven diagnostic software greets you when you turn the machine on. The automatic-boot feature enables you to start an operating system from any disk. Zenith also touts its three scrolling modes (basic, smooth, and jump), high-speed graphics display, monitor/debugger in ROM, and text display reputed to be twice as fast as the PC's. The Z-150 desktop model takes up 20 percent less desk space than the PC.

The 150 Series is also available in kit form from Zenith's Heath subsidiary. Hobbyists consulting the latest Heath catalog will find the Zenith desktop billed as the HS-151 and the portable as the HS-161. Both models have four expansion slots.

No sooner had Zenith released its new line than BPI Systems licensed Zenith to market 17 BPI software products. Among the programs ready for the Z-150 and Z-160 are BPI's *General Accounting*, *Accounts Payable*, *Accounts Receivable*, *Payroll*, *Inventory Control*, *Business Analyst*, *Personal Accounting*, and *Personal Investing*.

For further information contact Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025, 312/391-8744.

Logical Update

Logical Business Machines has announced enhancements to its LX-T, a PC XT compatible. At the November 1983 COMDEX, *PC World* tested an LX-T with a monochrome TTL monitor and reported that Microsoft's *Flight Simulator* did not run on the computer—a result that Logical does not dispute. The company claims that the machine now runs the program if an RGB monitor is attached or with a composite monochrome monitor if the machine is in the composite mode.

Based on its ongoing software tests, Logical reports that the LX-T can execute some, but not all, of the commands in programs such as *Friday!*, *1-2-3*, *Frogger*, *Night Mission*, *Four Point*, and *AutoCAD*. The LX-T is bundled with *Microsoft Word* and *Microsoft Plan*, MS-DOS 2.11, and Diplomat, Logical's natural language. Maximum RAM on the motherboard is 256K; disk capacity is 360K.



Sanyo's MBC 550 series offers PC compatibility for those on a budget.

Bargain Basement

Sanyo Electronics, the folks who bring you affordable transistor radios and TVs, is marketing what may be the least expensive of the PC compatibles. Called the MBC 550, the Sanyo computer lists for \$999. That buys an 8088-based machine with one half-height, single-sided, 5 1/4-inch floppy disk drive, 128K RAM expandable to 256K, high-resolution color graphics capabilities, and a parallel port. A monitor and an RS-232C port are optional. Another model, the MBC 555, includes two half-height, single-sided drives. The purchase price also includes Sanyo's own Graphics BASIC, MS-DOS 1.25, *EasyWriter I*, *WordStar*, and *CalcStar*.

The MBC 550 may be the Cabbage Patch Doll of the microcomputer realm, however, if reports of distribution delays are accurate. Los Angeles retailer Russell Wyluda, whose Personal Computer Services shop carries the Sanyo line, was

down to his last two units when contacted by *PC World*. Wyluda said that virtually no Southern California store had the Sanyo machine in stock. "Lots of places advertise, but the best they'll do is put your name on a list," he said. Sanyo may resolve its own supply problems, now that Intel has licensed the firm to produce 8088s for the MBC 550 and 555. Wyluda reported that a new, more compatible, more expensive Sanyo machine may also be on the way.

For further information contact Sanyo Business Systems Corporation, 51 Joseph St., Moonachie, NJ 07074, 201/440-9300.

Business

It Was a Very Good Year

Completing its first year of business, Compaq Computer Corporation is pointing to Texas-size success. The Houston-based manufacturer of PC-compatible portables recorded 1983 sales of \$111 million, a feat that Compaq claims makes it the most successful new company in American history—and second only to IBM in sales of 16-bit computers. (Shortly after Big Blue announced its portable, Compaq dropped the list price of its single-drive system from \$2995 to \$2495 and its dual-drive system from \$3595 to \$2995.)

Compatibles Update

So what do you do with such resounding success? You break ground for a new corporate headquarters. And in Houston, that means 187,000 square feet. Room for lots of portables.

While not quite duplicating Compaq's achievement, Columbia Data Products enjoyed a healthy 1983, reporting record sales and income for the year. Columbia sold more than \$56 million worth of desktop and portable PC compatibles, a sixfold increase over 1982's performance. Net income in 1983 exceeded \$3.6 million, compared to \$269,000 in the previous year, and shipments soared from 1200 units in 1982 to 24,100 by the close of 1983. The company went public in January.

Like Compaq's, Columbia's success is the construction industry's gain. The company recently added 35,000 square feet to its Maryland manufacturing plant. Columbia has also embarked on an ambitious dealer incentive program, backed by an extensive ad campaign in local newspapers. The tag line: "The more you think IBM, the more you like Columbia."

Elsewhere on the sales front, getting MAD may mean getting rich. MAD (Modular Advanced Design) Computer, maker of the MAD-1 microcomputer, recorded more than \$9 million in sales during its second month of production. More than \$6 million of that total is the result of MAD's two-year distribution agreement with The Computer Station, a retailer based in Vancouver, British Columbia. The MAD-1 features a 16-bit 80186 microprocessor and a sleek, modular design.

Software

Tandy 2000's Growing Software Base

A number of popular programs are now available for the Tandy TRS-80 Model 2000, an 80186-based MS-DOS compatible from Radio Shack. Among the software packages recently modified for the 2000 are MicroPro's *WordStar* and Lotus Development's *1-2-3*.

Through its Express Order Software program, Tandy is offering the complete *WordStar* package, which includes *CorrectStar*, *MailMerge*, *StarIndex*, and a tutorial. *WordStar* works with the full line of Radio Shack printers. Shipments of *1-2-3* to the more than 1000 Radio Shack Computer Centers nationwide were slated to begin last month, according to Lotus Development president Mitch Kapor.

Also available for the Tandy 2000 are *FinalWord*, from Mark of the Unicorn, and Pyramid Data's *Number Cruncher* series of business software products. *FinalWord* is designed for handling lengthy documents (such as novels) and features a window management system and automatic formatting options. Pyramid's *Number Cruncher* applications include spreadsheet, report generation, and relational data base management. Versions of *Number Cruncher* are also available for the DEC Rainbow, the Eagle Spirit portable, and Eagle XL desktop compatibles.

Corona Gives Framework a Spin

How PC-compatible is Corona Data Systems's portable computer? Compatible enough to run a hefty new integrated package designed for the PC, Corona is crowing. Ashton-Tate is relying on 75 Corona portables for its nationwide *Framework* demonstration tour.



Corona's portables, which deliver high-resolution graphics, are taking *Framework* on tour.

Framework, Ashton-Tate's entry in the integrated software sweepstakes, combines word processing, spreadsheet functions, business graphics, data management, forms processing, an outline generator, and concurrent access to other MS-DOS software. It also includes a procedural language known as "Fred."

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Circle 142 on reader service card

Spreading the Processed Word

If it's true that software sells hardware, the folks at Texas Instruments ought to be feeling good about their TI Professional Computer, which continues to receive software support. The latest additions to the TI library include *EasyWriter II* and *Select: The Word Processor*.

The *EasyWriter II* system incorporates components previously marketed as *EasySpeller II* and *Easy-Mailer II* and integrates word processing, spelling checker, and mail-merge functions. *Select: The Word Processor* for the TI Professional is functionally identical to its IBM PC counterpart. The program features key files, punctuation positioning, an expandable spelling checker, and a mail-merge function. At the same time Select introduced a separate MS-DOS version of the product for the Victor 9000.

For additional information on compatibles cited in this column, please consult "The Compatibles Line Up," PCW, Vol. 2, No. 4.

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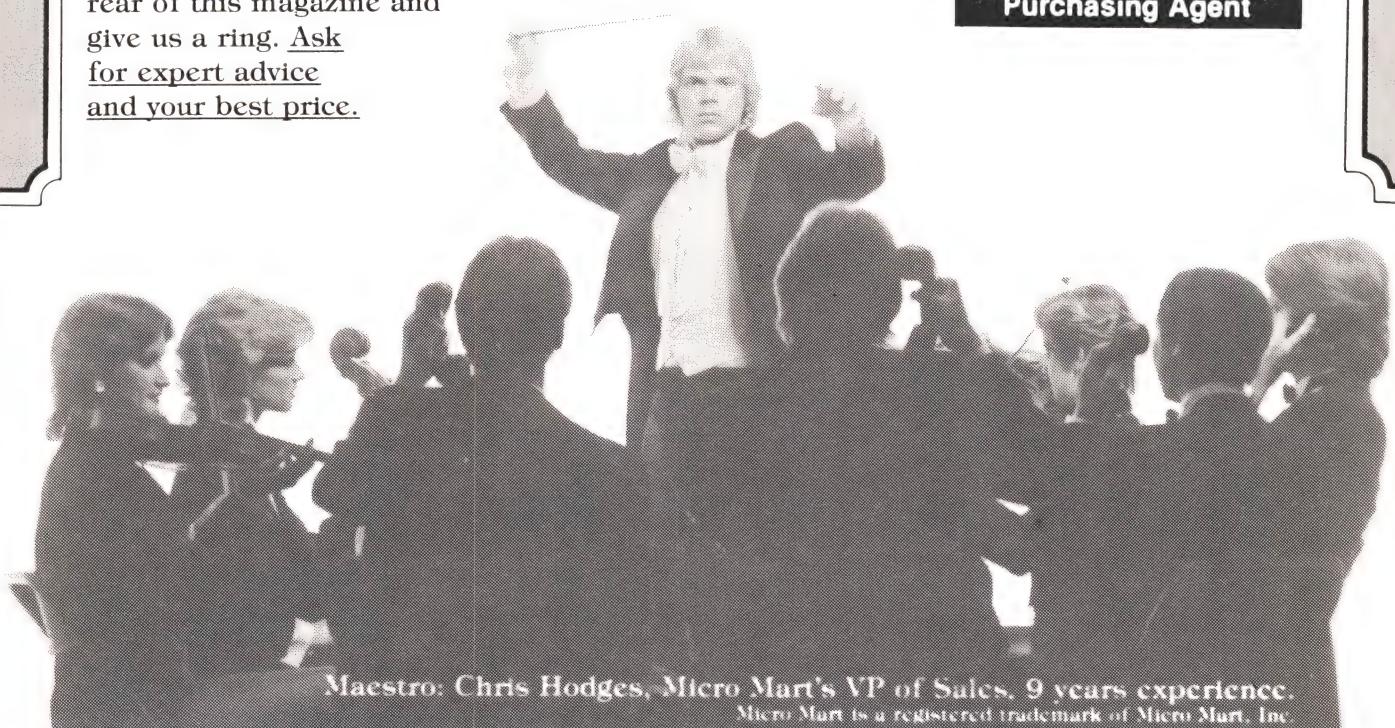
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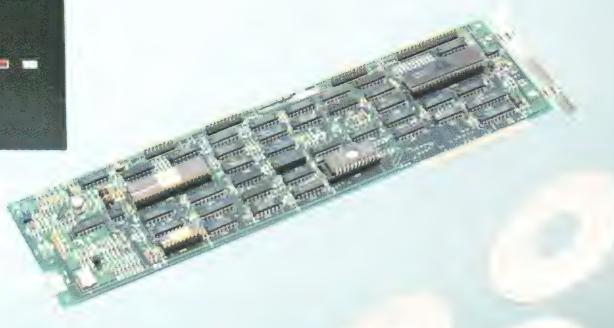
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Pick of the Plotters

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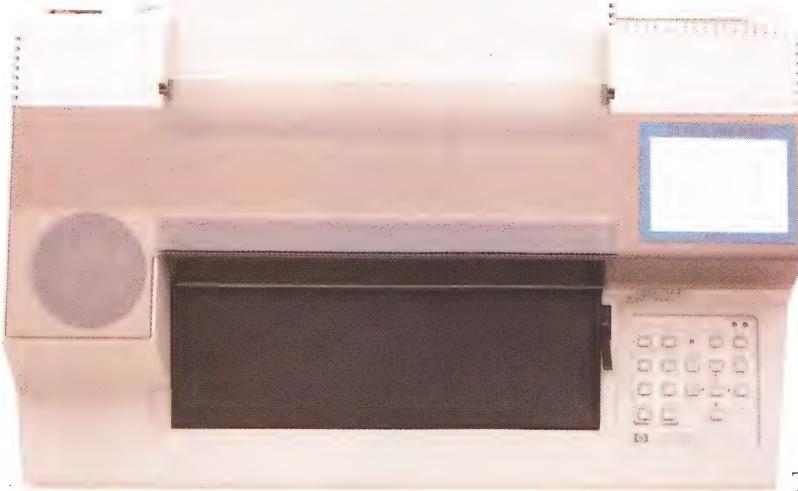
The Amplot II

Until recently most people in business were content to sketch their ideas or set up a table of numbers on a piece of paper and turn it over to a technical illustrator, who produced the graphs, transparencies, and slides necessary for a business presentation. However, personal computer hardware and software that produce graphs instantly are changing all that.

Computer graphics can be produced on screen or with a pen plotter. To enable you to create graphics on screen, the computer must have a graphics board that enables the screen to be addressed as a checkerboard of dots rather than character by character. Doing graphics on the screen is useful and satisfying; you can make changes easily and see the results immediately. However, it's often necessary to include graphics in a report or to present charts and graphs in a business meeting or seminar. On these occasions a pen plotter comes in handy. Plotters are capable of producing ink drawings comparable to those produced by hand and can be used with paper, vellum, transparencies, or other suitable plotting media.

This article concentrates on high-performance plotters, which are those most likely to be used in a business environment. The three products reviewed are the Houston Instrument Hiplot DMP29, the Hewlett-Packard HP7475, and the Amdek Amplot II. (Certain printers can also be used for graphics, but because their graphics capabilities are limited in terms of versatility and quality, printers are not considered true plotting devices.)

The tests used for this review were limited to business applications such as bar charts, pie charts, and XY plots (line graphs). In contrast, scientific applications often demand contours, vectors, wire-frame diagrams, and perspective and isometric plots. Of course these two applications are not mutually exclusive, and considerable overlap exists in many business environments.



The HP7475

The Hardware

As Table 1 shows, the HP7475 and the DMP29 plotters are generally comparable in hardware features. Their maximum pen speeds and resolutions are close. The HP7475 is more compact and offers a larger number of character sets, pen speeds, and built-in ROM instructions (codes that tell the plotter how to perform functions such as drawing a box or a circle or hatching or filling an area). As Table 2 shows, the HP7475 also has a faster pen acceleration. The DMP29, on the other hand, has eight pens compared to the HP7475's six and has a slightly higher maximum speed. The Amplot II has six pens and a resolution that is four times coarser than the other two. Its maximum speed is approximately half as

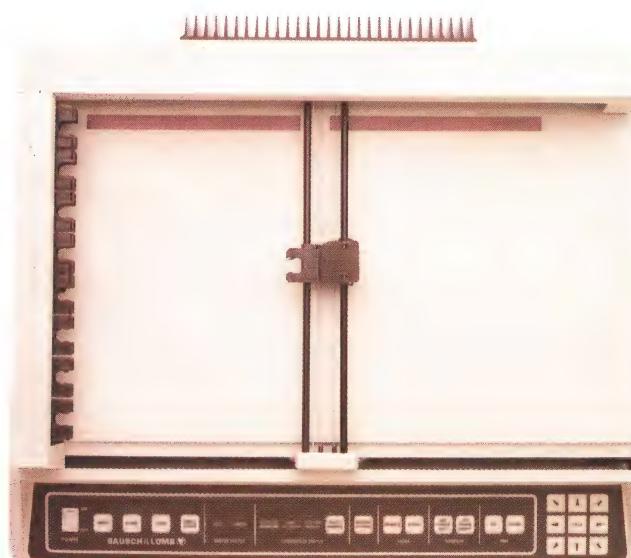
fast as that of the other two, and it has a limited number of built-in character sets and ROM instructions. On the other hand, the Amplot II is considerably less expensive than the DMP29 or the HP7475. The Amplot II comes with a parallel and a serial attachment; the other plotters have serial attachments, and parallel attachments can be purchased separately.

Ease of Use and Versatility

A good plotter should require little effort from the user. It should provide well-defined options and accept simple commands. The commands used to control a plotter may be compared to the language used to communicate with a computer. The higher the level of the communication language (the more English-like it is), the easier the plotter is to use. The versatility and ease of use of a plotter are directly related to the number and simplicity of its built-in commands and functions. Other factors are the quality of the language, the semantics, the error trapping and error messages, and the completeness of the documentation.

The HP7475 provides a good printed manual with a number of examples that illustrate the use of the plotter. The DMP29 manual is only adequate; it isn't as easy for a novice to understand and is poor in terms of examples. The Amplot II came with a preliminary manual that looked like it had been photocopied and was of a poorer quality than the other two.

In terms of ease of use the HP7475 and the DMP29 are comparable (see Table 3). The HP7475 has an edge in the number of built-in instructions it has and in its ability to create labels, to draw axes and rectangles (the latter are handy for bar charts), and to do shading. The DMP29, on the other hand, has more built-in options for plot resolution (the smallest distance that the pen can



The DMP29

Characteristic	HP7475	DMP29	Amplot II
Size of footprint (inches)	14.5 by 22.4	18.6 by 21.9	18 by 22.5
Maximum working area required (inches)	31.5 by 22.4	18.6 by 21.9	18 by 22.5
Height (inches)	5	5.5	5.5
Net weight (pounds)	16	25	23.1
Maximum size of plots (inches)	10.2 by 16.3	10 by 15	10.6 by 15.7
Nominal paper size accepted (inches)	8.5 by 11 11 by 17	8.5 by 11 11 by 17	8.5 by 11 11 by 17
Number of pens	6	8	6
Number of ROM instructions	56	36	20
Number of built-in character sets	19	8	1
Maximum plot size resolution (inches)	.001	.001	.004
Maximum axial pen speed (inches per second)	15	16	7.9
Possible number of pen speeds	128	5	1
Standard communications interface	serial	serial	serial/parallel
Optional interface	IEEE-488 parallel	IEEE-488 parallel	

Table 1: A summary of hardware characteristics

Hardware Features	HP7475	DMP29	Amplot II
Maximum pen speed (inches per second)	15	16	7.9
Maximum acceleration	2G	.5G	---
Repeatability without pen change (inches)	.004	.004	.012
Repeatability with pen change (inches)	.008	.008	.016

Table 2: Speed characteristics

move) and two additional pens and can plot incrementally and automatically smooth curves. The Amplot II lacks many of these features. They may have to be added by writing software, which is not the best solution from the point of view of the user.

The HP7475 is the most intelligent of the three plotters. It provides 56 built-in commands in comparison to the DMP29's 36 and the Amplot II's 20. From the viewpoint of a programmer, the number of commands available translates almost directly into the ease with which custom software can be designed. In this way the Amplot II is especially restrictive.

Some of the HP7475 commands that are missing from the other two plotters are likely to be especially handy for custom software design. In this category are the built-in commands for drawing a rectangle, filling

(shading) areas, typewriter emulation for labeling, and embedding variable strings in labels. In the other plotters these commands, if required, will need to be emulated by software. Some of the commands, though simple in concept, may need complex programming. For example, devising the set of instructions to shade an arbitrary area is not a trivial task. The typewriter emulation command allows a string of characters, such as a label, to be sent to the plotter; characters can be moved left, right, up, or down by a character pitch rather than in plotting increments. The embedded variable string command enables the user to combine a variable, which may change from one plot to another, with text that is otherwise identical from one plot to another. It took us a few hours to write a program in FORTRAN to accomplish the same objective for the DMP29. (We could have done it more quickly in BASIC; however, since we were using existing FORTRAN plotting software, we needed the interface to be in FORTRAN.)

Plotter Feature	HP7475	DMP29	Amplot II
Quality of manual	good	adequate	poor
Examples in manual	sufficient	lacking	lacking
Number of ROM instructions	56	36	20
Built-in options for plot units	1	3	1
Line types available	7	11	4
Scalable line types	6	none	3
User-defined plot units	yes	no	no
Absolute or relative addressing	yes	yes	yes
Incremental mode of plotting	no	yes	no
Ease of drawing axes with ticks	easy	not easy	easy
Hardware window capability	yes	yes	no
Software window capability	yes	yes	yes
Scaling capability from hardware	yes	yes	no
Scaling capability from software	yes	yes	no
Interpolation smoothing	no	yes	no
Ability to rotate plot by 90°	yes	yes	no
Fill area (automatic shading)	yes	no	yes
Labeling with variable substitution	yes	no	no
Typewriter labeling emulation	yes	no	no
Command to plot a rectangle	yes	no	no
Command to plot a circle	yes	yes	yes
Command to plot an arc	yes	yes	yes
Command to plot an ellipse	yes ¹	yes	no
Character slanting option	flexible	one mode only	no
Automatic pen-up when not plotting	yes	yes	yes
Pen holder arrangement	very good	good	fair
Plotter on-line indication	no	yes	no
Indication when plot is outside window being plotted	no	yes	yes

¹Needs two commands

Table 3: Ease of use and versatility

Nature of Plot	HP7475	DMP29	Amplot II
Pie chart	5:22	3:30	14:00
Bar graph	3:13	2:15	9:22
XY plot	1:17	0:57	2:30

Table 4: Comparison of plotting speeds for typical business plots shown in Figure 3.

● Review

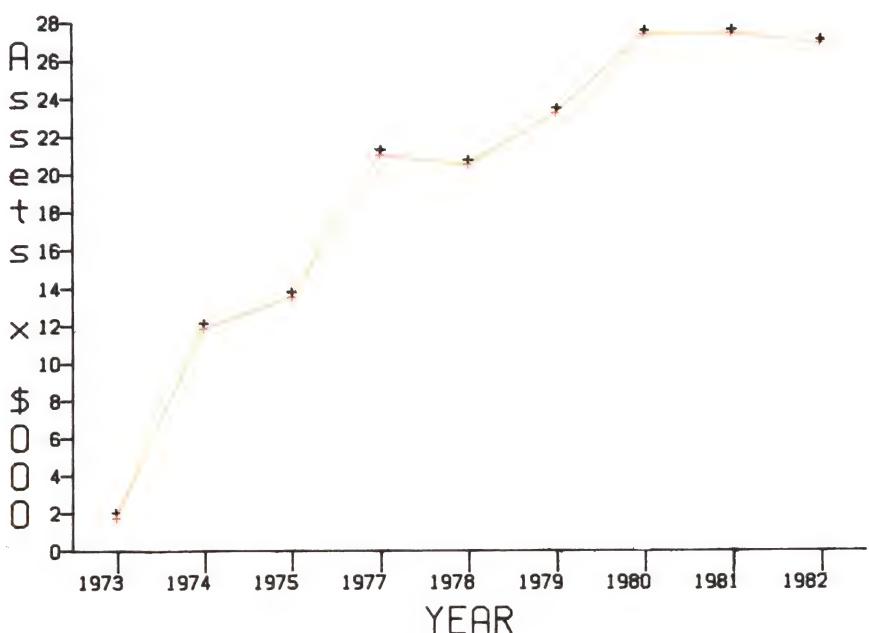
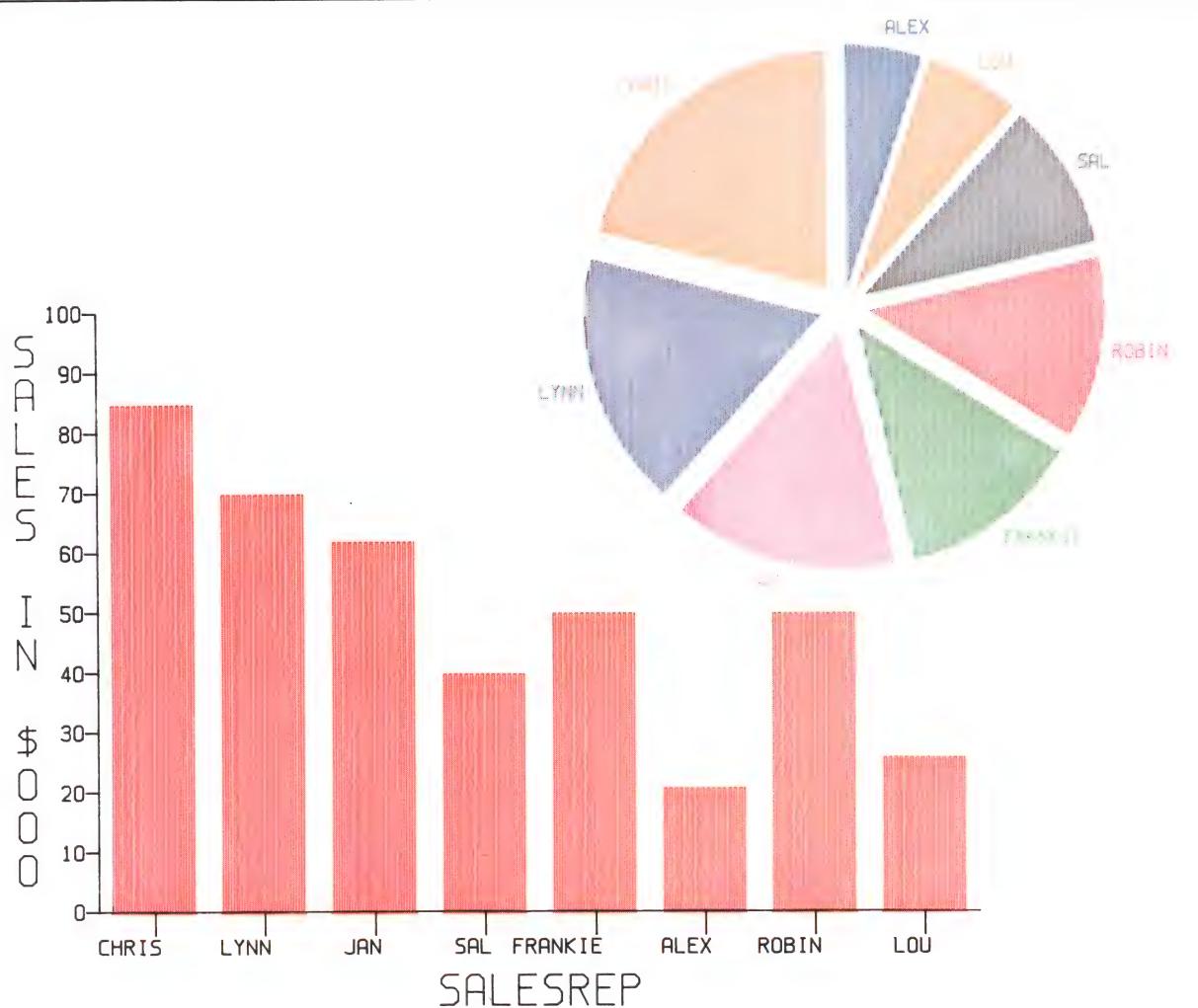


Figure 1: The plots used to test the relative plotting speeds. The graphs shown were produced by the DMP29; identical graphs were produced by the other two plotters.

Speed

The features that determine the theoretical speed of the plotters are summarized in Table 2. The HP7475 leads in these terms, having the highest acceleration and a high pen speed; the DMP29 is a close second, with the highest theoretical pen speed, while the Amplot II has much slower specifications. However, these are only promises. The actual performance of a plotter is strongly influenced by other factors. Depending on the type of plot being prepared, the plotter may spend a lot of time retrieving and replacing pens, writing character sets, getting from one place to another, or even waiting to obtain data from the computer.

What really concerns a user is how long it takes to produce a plot. To test actual performance, the *BPS Business Graphics* software was used to produce bar charts, XY plots, and pie charts. Table 4 shows the times taken to draw the various built-in example charts contained in the *BPS* manual. Figure 1 shows the graphs used for this comparison.

To our surprise, in this particular test the fastest plotter turned out to be the DMP29. The HP7475 was approximately 50 percent slower for all three charts. Since the two plotters have similar maximum pen speeds and the HP7475 has a higher acceleration, the answer had to lie either in the software being used or in the communications link between the computer and the plotters. The pen speeds chosen by *BPS* were the highest for each plotter, and the data transmission rate (in bits per second) was identical in both cases. When we ran some simple experiments such as sending a stream of characters and plotting some simple curves directly from the computer, both plotters took about the same amount of time.

In discussions with the technical support staff at both Houston Instrument and Hewlett-Packard, it emerged that the cause of the plotting speed disparity probably did not lie in the hardware features of the two plotters. Further investigation revealed that the HP7475 driver in the *BPS* package did not optimize the plotter's performance. The HP7475 has a 1K buffer. The *BPS* package, however, sends data in 255-byte strings and imposes a delay of 200 milliseconds between transmissions. This slows the plotter's performance considerably. Therefore, it is possible that with optimized drivers the HP7475 and the DMP29 will deliver similar performances. This conclusion is reinforced by the results of some tests conducted with the *1-2-3* and *Chart-Master* software packages. When these packages were used, neither of the plotters appeared to have a consistent speed advantage; their times for a number of plots were within 5 to 10 percent of each other.

The Amplot II was significantly slower than the other two plotters; it was three to four times slower than the DMP29. The Amplot took 14 minutes to do a simple pie chart. This plotter has no built-in buffer, so it must obtain data from the computer byte by byte as it plots. However, Amdek reports that the plotter draws up to twice as fast when operated in the parallel mode.

The DMP29 provides three plot resolutions: .001 inch, .005 inch, and .1 millimeter (mm). The coarse .005 resolution may speed up the plots considerably under certain kinds of plotting instructions, especially if the information is transmitted to the plotter in a vector mode.

The plotter may spend a lot of time retrieving and replacing pens, writing character sets, and getting from one place to another.

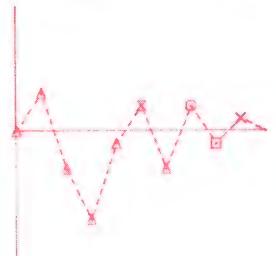
This resolution is often more than adequate; for example, the pie charts for Amplot II shown in Figure 2 employ a resolution of .004 inch. The HP7475 provides only one resolution, .025 mm (.001 inch), and all plots must be done in this resolution.

Quality of Plots

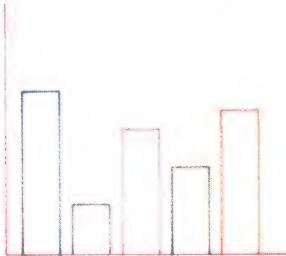
In terms of output quality the HP7475 is the most pleasing. The pie charts produced by the three plotters are shown in Figure 2; the HP7475 has the most even shading and line control of the three. Its line quality and characters are sharp, and it provides high-resolution plots that are more than adequate for most business needs. The Amplot II is a close second, with a good line quality, while the DMP29's drawings are discernibly uneven. The differences are, however, so minor that perhaps they are of no consequence for most applications. The built-in character set of the HP7475 is well balanced and aesthetically the most pleasing of the three. The characters produced by the DMP29 are a little jagged and squat. The character sets of all the plotters can, of course, be replaced under software control.

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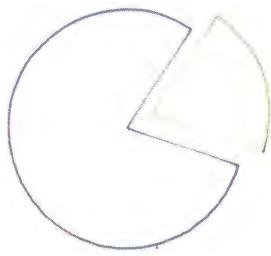
DMP29 MULTI-PEN PLOTTER



LINE GRAPHS



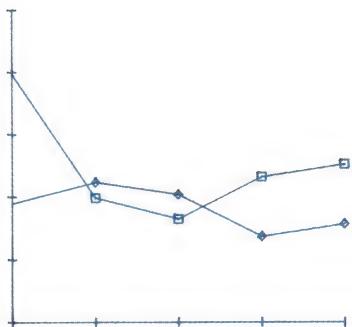
BAR CHARTS



PIE CHARTS

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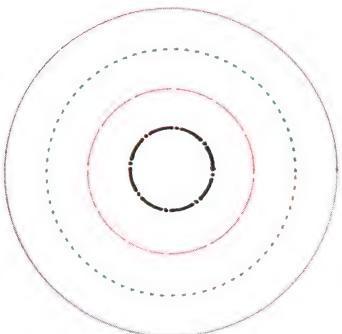
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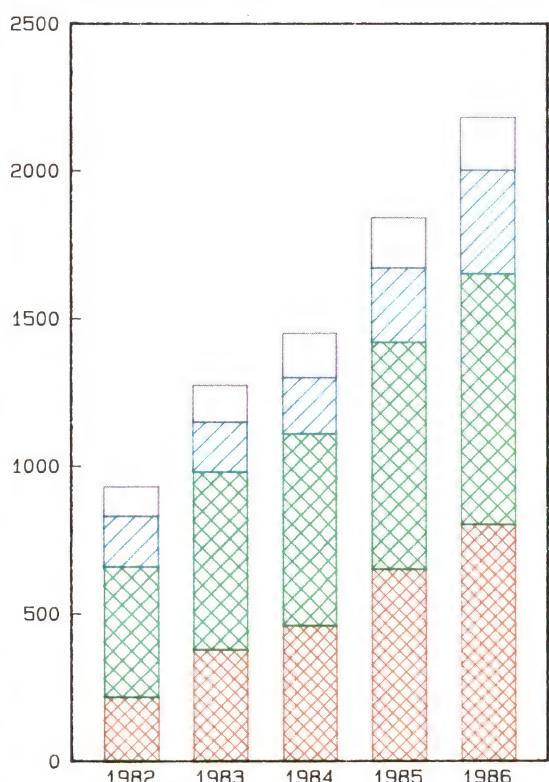
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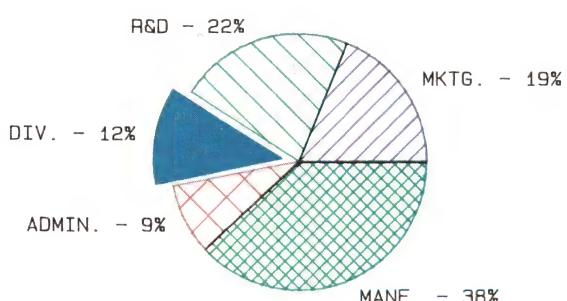
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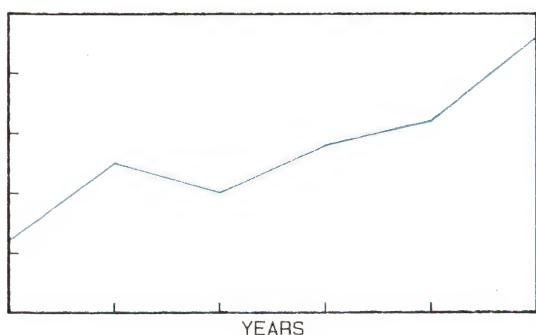
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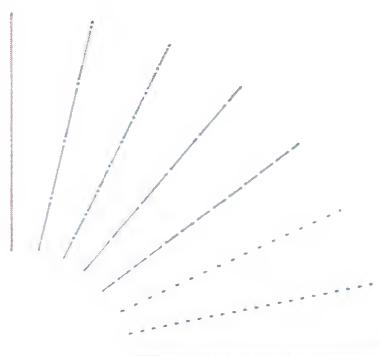


DIVIDEND HISTORY



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AMDEK



AMPLLOT III

The built-in demonstrations and self-tests for the HP7475 (top right), the DMP29 (top left), and the Amplot II (bottom) plotters. Note that the DMP29 prints out the switch settings for the communications parameters as well as the revision number of the ROM installed in the plotter. -4

Review

The line quality of an older version of the DMP29 was uneven. The line varied in thickness or disappeared altogether as the pen moved across the paper. Houston Instrument says that the problem was due to a mismatch between the pen-holding mechanism on the older units and the special adapter required to mount the ink pens. The new units are shipped with a redesigned pen holder. A new unit tested seemed to be free from this problem.

Paper and Pen Movement

The HP7475, the DMP29, and the Amplot II may all be described as "flatbed" plotters. However, there is an important difference between the HP7475 and the other two. Since a plot is a two-dimensional figure, three types of pen movement are needed to complete a plot: one along the length of the paper, one along its width, and an up-and-down motion to make or break contact between the paper and the pen. With the HP7475, the paper is held on both sides between pressurized rollers and moves in and out of the plotter under the pen to provide vertical motion. This plotter may be described as a "moving-paper" plotter. The pen has only two movements: away from and onto the paper or across the width of the paper. With the other two plotters a sheet of paper is held on a flat platform, and the pen does all the moving.

Both the stationary and the moving-paper options have advantages. The moving-paper solution makes possible a compact plotter and a faster pen acceleration because the pen motion is mechanically simpler. However, this design also requires a large working area in front of and behind the plotter. And because the paper moves at a fairly high speed, you may have to suspend plotting to view the progress of work. The stationary paper option makes monitoring the progress of work easy and provides greater freedom in the use of different kinds of plotting media, such as paper or vellum. In addition, the working area is limited to the footprint of the plotter.

The Paper-Holding Mechanism

The plotters all use different mechanisms for holding the paper: paper on the HP7475 is held between rollers, the DMP29 uses adhesive strips that hold the underside of the paper on the platform, and the Amplot II has magnetic strips to anchor the paper on the platform. All three arrangements have pros and cons.

The main problem with the HP7475 paper-holding arrangement is that the pressurized roller may provide a poor grip or leave a mark on the medium if it is either

very thin (such as mylar film) or very thick (such as cardboard). The inexpensive adhesive strip used on the DMP29 may eventually wear out and need to be replaced. The arrangement used by Amplot II seems superior to that used by DMP29, although the magnetic strips can get in the way of the pen when smaller plotting papers are used.

The differences in the paper-holding mechanisms also impose some limitations on the paper sizes suitable for the plotters. All of the plotters accept metric sizes A3 and A4. The distance between the HP7475's fixed rollers is approximately 11 inches, so one dimension of the plotting paper must be close to that size. The other plotters can use any paper size up to a maximum of 11 by 17 inches. However, some improvisation may be required for odd paper sizes. It is easy to use double-sided adhesive tape to hold two edges of the paper to the flatbed; the other two sides are mechanically held by slots along the sides of the plotter bed.

The HP7475 keeps the pens sealed during temporary storage, and the rubber caps keep the pen tips moist.

Pen-Holding Mechanisms and Pen Caps

The HP7475 uses a six-pen carousel that sits in a well to the left of the units. The carousel comes with retractable pen caps that uncover and cover the pens when they are retrieved or replaced. The well has a plastic cover. The DMP29 and the Amplot II have small plastic receptacles mounted to the left of the unit that hold the pens individually. In the Amplot II the pens are lightly held when in use and tend to fall out. For both the DMP29 and the Amplot II, the clearance between the pen nib and the paper is so small that an unevenness in the paper leads to scratches as the pen moves, but this problem is more serious for the Amplot II.

The HP7475 pen cover design is preferable because it keeps the pens sealed during temporary storage, and the rubber caps keep the pen tips moist. With the other plotters, once the pens are in their holders, they are unsealed and therefore tend to dry out if not removed and capped soon after use.

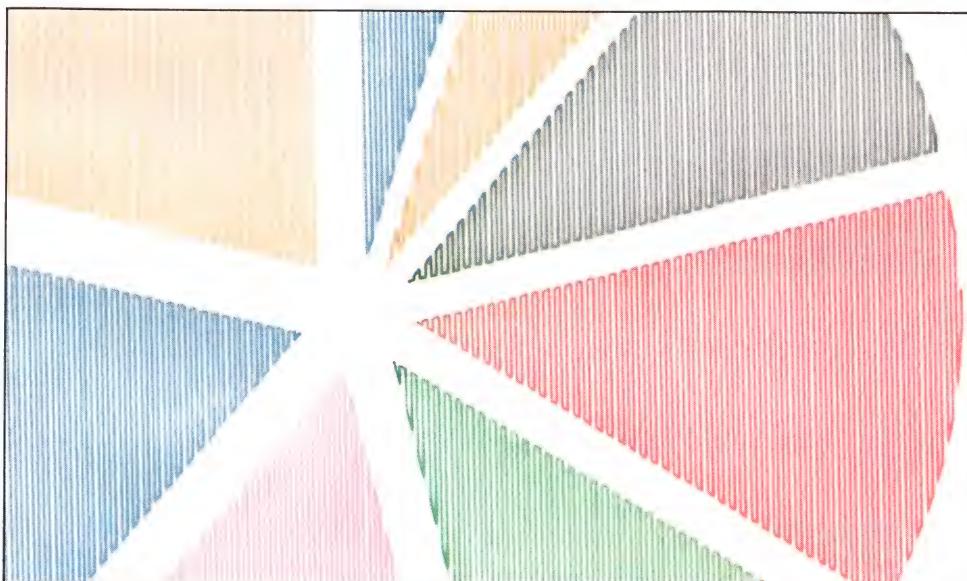
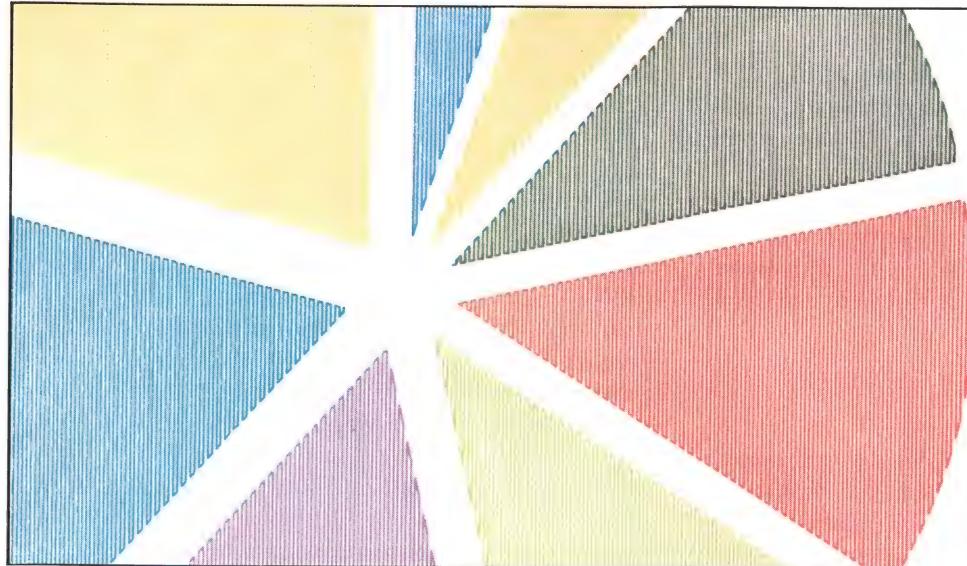


Figure 2: Pie charts drawn by (from top to bottom) the HP7475, the DMP29, and the Amplot II illustrate plotting quality. The HP7475 produces the most even shading and the sharpest lettering.

Review

A minor irritant with the DMP29 is its tiny pen caps. The problem is, what do you do with them when the pen is in use? The front panel of the DMP29 is practically flat with a slight forward slope. If the caps are placed there, they roll off. If left on the work table, these small caps have a habit of proving Newton wrong and disappearing. The HP7475 and the Amplot II have a recessed area in the front panel where the pens and the pen caps can be temporarily stored.

Hardware and Software Support

Both the HP7475 and the DMP29 claim extensive third-party software support. Hewlett-Packard can provide a list of over 200 software vendors that support the HP7475. According to Houston Instrument, the DMP29 is supported by well over 150 vendors. The Amplot II commands a smaller but significant following; the manufacturer claims that more than 60 vendors support this plotter.

All three manufacturers seem to offer extensive customer support. The reviewers have had the DMP29 for over a year. In that time we have been able to get Houston Instrument to answer our questions and solve any problems we've had. The support is reliable and efficient. An independent user of a Hewlett-Packard plotter is also happy with the support he has received. This report confirms the impressive quality of support provided by both manufacturers during the review. We have not been able to locate a long-term user of Amplot II, but our questions to Amdek were answered in a very satisfactory manner.

Recommendations

Now for the difficult part: which one do we recommend? As always, the choice to some extent depends on the purchaser's needs and budget. For most business environments we recommend either the HP7475 or the DMP29. The Amplot II may be too slow for most business environments, where time is one of the most important commodities. The Amplot II also has the fewest built-in instructions, which translates into the use of expensive programming labor for custom applications when no prepackaged software can be used.

The choice between the HP7475 and the DMP29 should perhaps be made on the basis of the following three factors: the type of software and plotting media to be used and the available working space. If you plan to use primarily prepackaged software, require plots on

special media (such as vellum, mylar, or cardboard), and have limited working space, the DMP29 may be the better choice; otherwise, the HP7475 is a safe bet. Since most business needs can be adequately met with plots on paper and transparencies, we prefer the HP7475. However, we strongly recommend that your final choice be made with reference to individual plotting needs. ●

Akshai K. Runchal is president of Analytic and Computational Research, Inc., a computer software and hardware consulting firm that specializes in scientific and engineering applications. Jacob Treger and Clement K. Tam are freelance computer consultants.

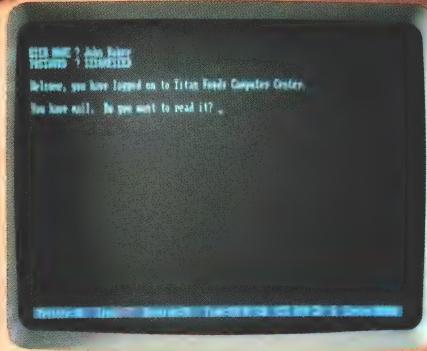
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Amdek Corp.
2201 Lively Blvd.
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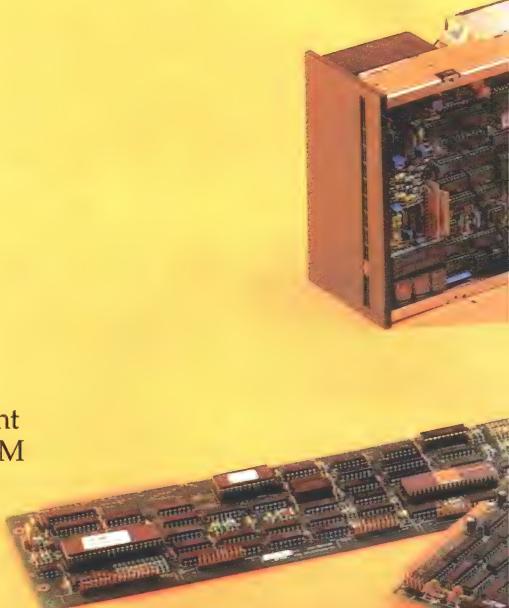
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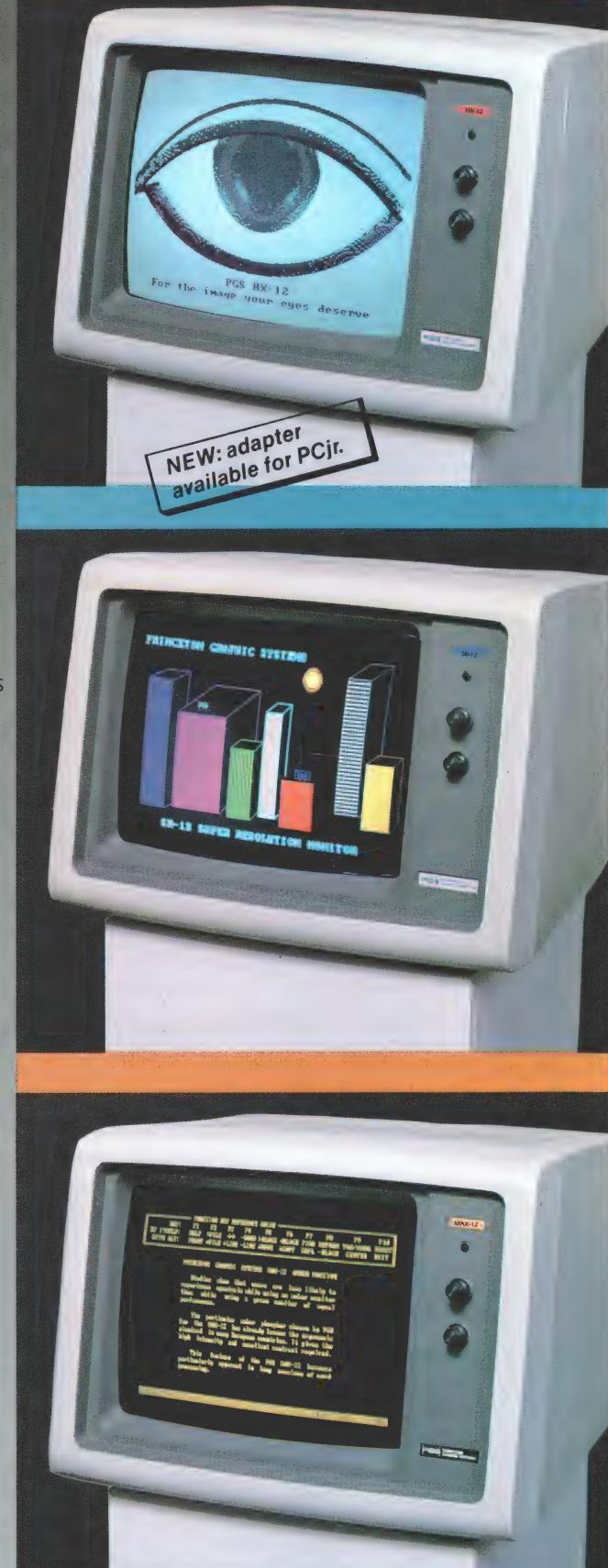
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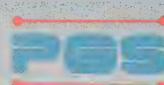
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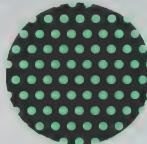


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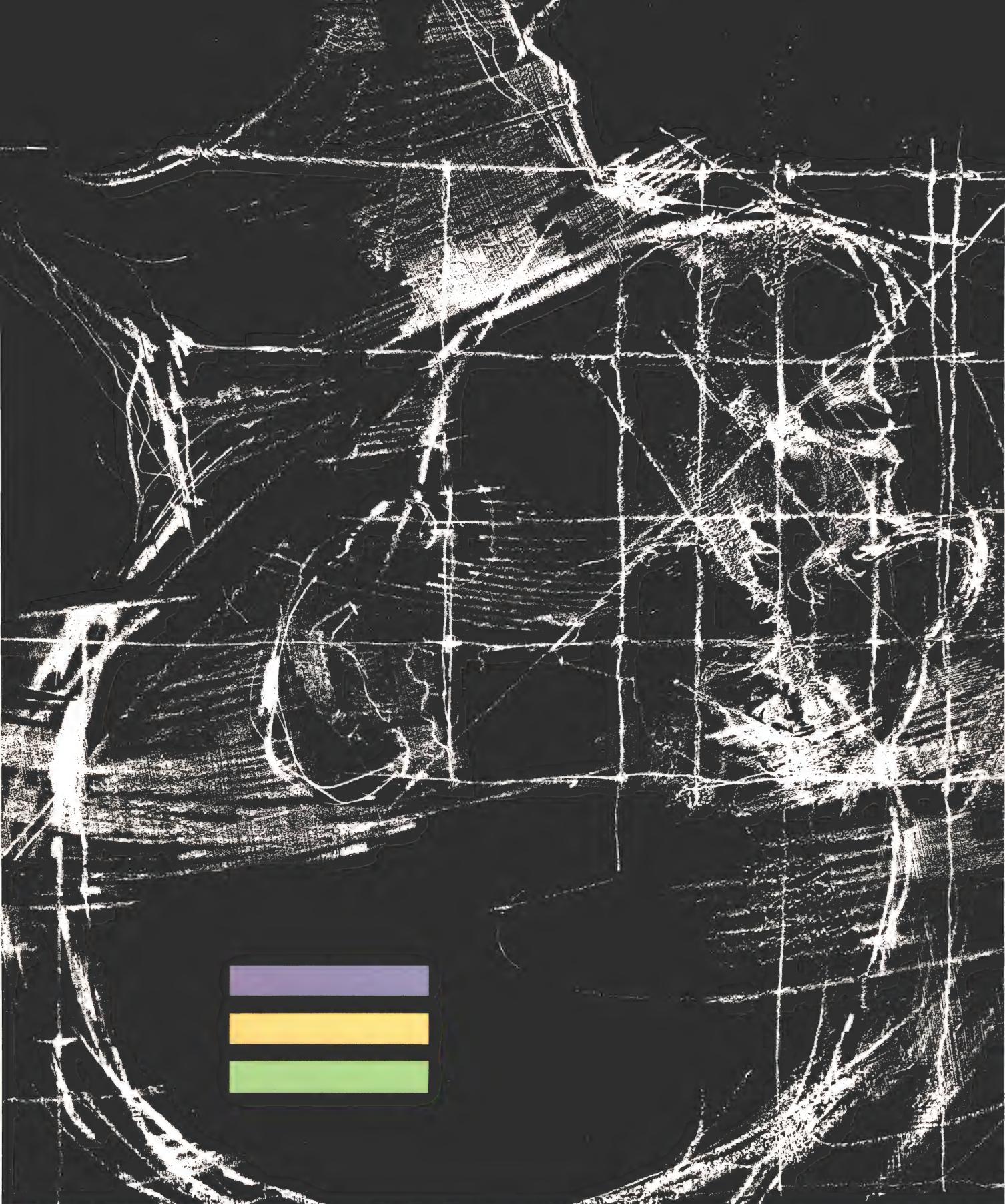
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Burton L. Alperson

Lotus Development's 1-2-3 has become the most commonly used software for data manipulation and representation on the PC. Although the heart of the program is its spreadsheet, 1-2-3 also contains graphics routines that are fast, powerful, and easy to use. However, many 1-2-3 users find themselves limited by the program's lack of functions and graph types. Horizontal bar graphs, area graphs, and pie charts with exploding slices are all beyond the reach of 1-2-3. The program cannot handle floating legends and many types of fitted curves. Compared to most dedicated graphics programs, 1-2-3 supports a limited number of printers, plotters, and other output devices.

Consequently it is reasonable to ask if a dedicated graphics program can provide enough additional power over 1-2-3 to justify its expense. This review examines two comparably priced graphics packages for the PC: *Chart-Master* from Decision Resources and *BPS Business Graphics* from Business & Professional Software.

Graphic representation of data serves two main functions—analysis and presentation (see “The Boom in Business Graphics” in this issue). The major objective of analysis graphics is the rapid manipulation of on-screen images to discover relationships that

program flexibility and a variety of graph types and functions become far more important than speed. Both programs are superior to 1-2-3 for creating professional presentation graphics.

The Interocular Traumatic Test

Figures 1, 2, and 3 illustrate, in sequence, an increased ability to tell a story. The story is that a certain drug has a dramatic influence on hypertension. Putting yourself in the role of the presenter, try to ignore all considerations of scientific validity and experimental design. Using these charts, you want to convince your audience that the data from this one patient shows the effectiveness of the drug.

Figure 1 was developed with 1-2-3. Although an experienced graph reader could figure out the story, the graph would not pass the Interocular Traumatic Test (you know what the conclusion is when the data hit you between the eyes). Several compromises had to be made to accommodate 1-2-3's lack of flexibility. The variable labels (Sy, Di, Mean Pre Sy, Mean Pre Di) had to be abbreviated

If your main interest is analysis, there is little advantage in going beyond 1-2-3.

might have gone unnoticed from a table of numbers. If your main interest is analysis, there is little advantage in going beyond 1-2-3. Due to the designs of the user interfaces and the slow plotting speed on a monitor, neither *Chart-Master* nor *BPS Business Graphics* can compete with 1-2-3 for strictly analytical purposes.

Both *Chart-Master* and *BPS Business Graphics* are designed primarily for presentation graphics, where the emphasis is on making a point or telling a story. In presentation graphics,

Figure 1: 1-2-3
Epson FX-80
printer output.
Graph titles are
highly abbreviated,
and the point at
which the drug was
introduced is
not visually
apparent.

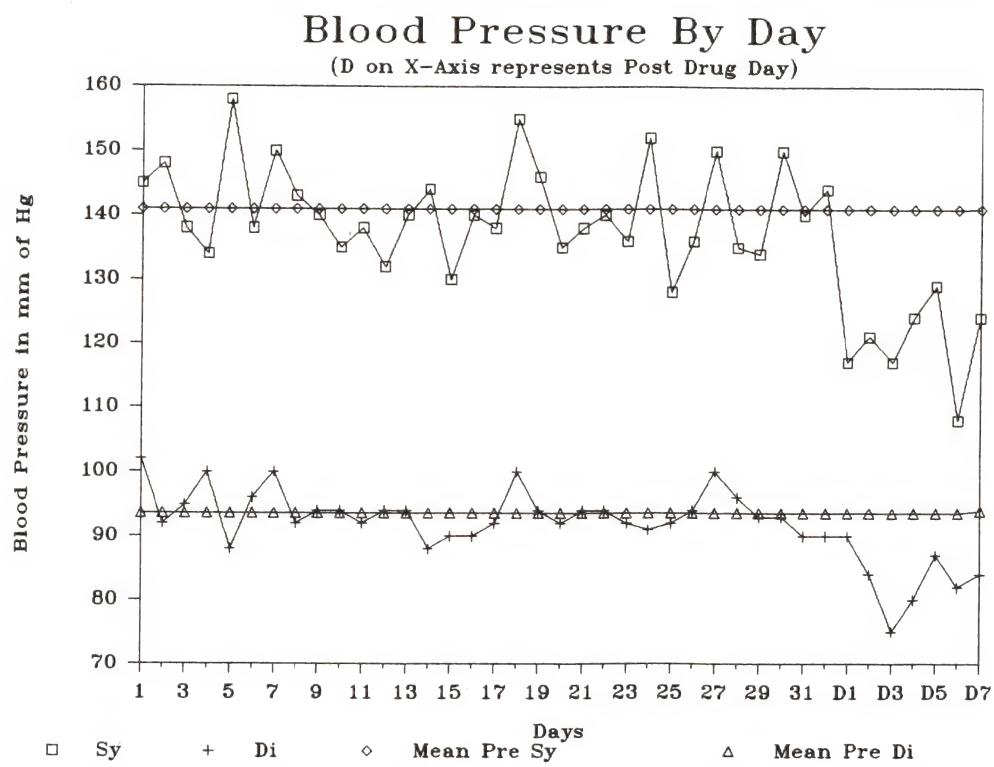
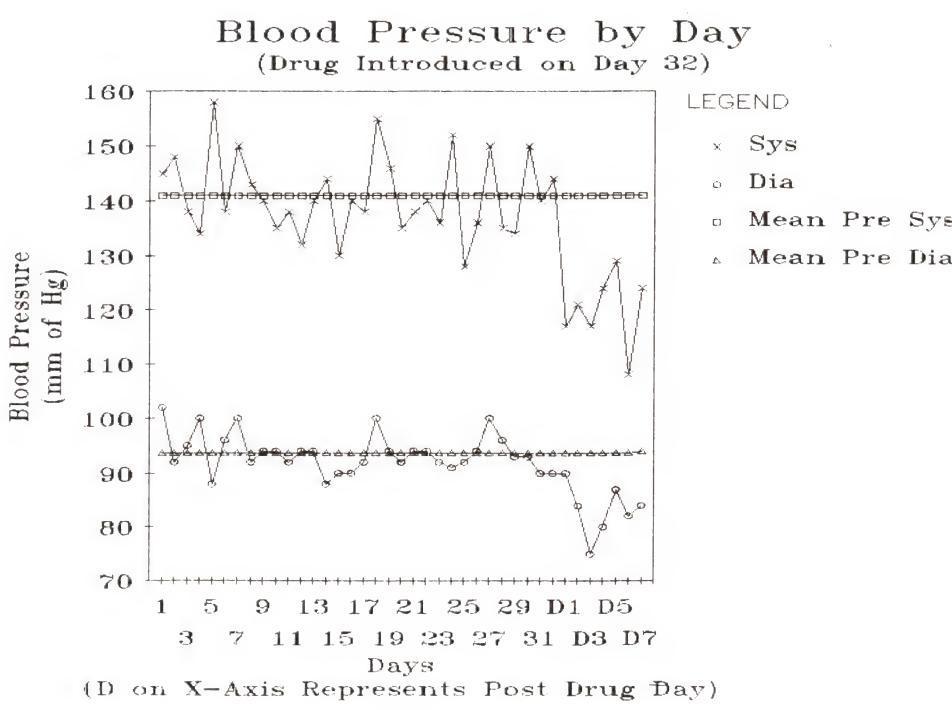


Figure 2:
Chart-Master
Epson FX-80
printer output.
Representation
of the variable
titles is more
clear than with
1-2-3.



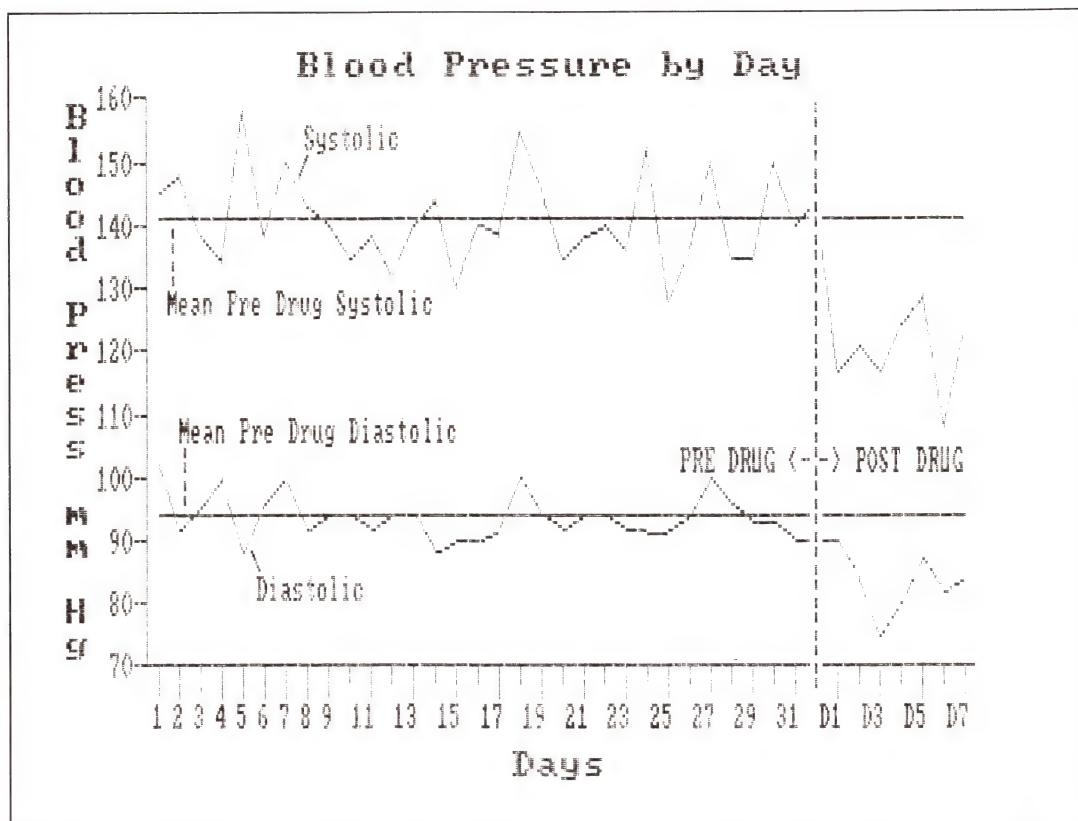


Figure 3:
BPS Business
Graphics Epson
FX-80 printer
output. Legends
are spelled out
and are placed
in the relevant
locations.

to such an extent that they require additional explanation to become intelligible. Longer variable labels would have been truncated in 1-2-3's output. The point at which the drug was introduced is weakly represented and would probably have to be pointed out in an additional verbal presentation.

Figure 2, produced with *Chart-Master*, is an improvement. Taking advantage of its additional titling capabilities, *Chart-Master* can strengthen the representation of the introduction of the drug (by the title 'Drug Introduced on Day 32'). The program also improves the representation of variable labels.

Figure 3, produced by *BPS Business Graphics*, could almost stand without additional explanation. The most important increase in capacity

here is the program's ability to produce floating legends or titles. (By contrast, *Chart-Master* can only produce floating legends on plotter output.) Now the variable labels can be fully spelled out (Systolic, Diastolic, Mean Pre Drug Systolic, Mean Pre Drug Diastolic) and located on the graph so that each title points to its object. Moreover, by inventing a floating title consisting of a vertical line, the point at which the drug was introduced becomes a focal point of the figure.

Menus versus Commands

Although the capacities and features of *BPS Business Graphics* and *Chart-Master* are similar, the programs are radically different in design philosophy. *Chart-Master* is completely menu-driven, while *BPS Business Graphics* is almost completely command-driven. In spite of advertising,

hyperbole to the contrary, the difference between these modes of operation is a matter of taste rather than quality. But the usual trade-off seems to hold here: *Chart-Master* is easier for a novice to use than *BPS Business Graphics*, but the cost of this ease of use is a slight loss of power and flexibility.

Both programs can accept data from other programs easily, as long as the data is in a standardized format. As an experiment the data for Figures 2 and 3 were originally entered on a 1-2-3 worksheet, rather than with the two programs' data entry routines. You can produce a .DIF file in 1-2-3 and easily copy it over to *Chart-Master*. *Chart-Master*'s carefully structured prompts and menus make the process brief and uncomplicated. *BPS Business Graphics*'s data import facility requires data to be in

1-2-3	BPS Business Graphics	Chart-Master
Available Graph Types		
Line	Line	Line
Bar	Vertical bar	Clustered bar
XY	Scatterplots	Scatter chart
Pie	Pie	Pie
Stacked bar	Stacked bar	Stacked bar
—	Area	Area chart
—	Horizontal bar	Horizontal bar
—	Fitted curves	Regression
—	Combination line/bar	—
—	—	Exploded slice pie
—	—	Hi-low-close
Available Plotting Functions		
—	Exponential	Exponential
—	Line	Linear
—	Logarithm	Logarithm
—	Moving average	Traveling average
—	—	Power
—	Constant	—
—	Parabola	—
—	Sine	—
—	Smoothed moving average	—
—	Data + constant	—
—	Data - constant	—
—	Data * constant	—
—	Data / constant	—
—	Cumulative addition	—
—	Cumulative subtraction	—

Table 1: Graph types and plotting functions compared.
BPS Business Graphics and Chart-Master offer substantial improvements in graph types and plotting functions compared to the analysis graphics features found in Lotus Development's 1-2-3.

ASCII format, so in order to transfer files to that program you need to create a .PRN file in 1-2-3 and send it to *BPS Business Graphics*'s INTER-CHANGE program. The routine functions without surprises.

Thanks to a well-structured set of menus and prompts, the dialogue necessary to create Figure 2 with *Chart-Master* can be carried out with little thought or preplanning. Since the prompts rarely leave you guessing about the appropriate response, reading the documentation is largely unnecessary.

Although *BPS Business Graphics* is more difficult to learn, after you master the command syntax you can create comparable graphs faster than with *Chart-Master*. Unlike other

graphics programs, *BPS Business Graphics* stores data for each variable in a different file. You retrieve the data for one variable, then lay it into your graph the way you want it to appear. You then pick up the next variable, and so on. Thus, you build a graph element by element, maintaining a great deal of control over each variable.

BPS Business Graphics contains a powerful batch capability in the form of a "take file." You can save a sequence of commands and then bring the series into play with a simple command. Batch execution is particularly useful if you frequently produce similar graphs. You can implement the constant characteristics with the take file and then edit the variables and make additions before producing hard copy.

Graph Types and Functions

Table 1 compares the available graph types and plotting functions in 1-2-3, *BPS Business Graphics*, and *Chart-Master*. Unfortunately, software houses do not employ a standard terminology for graph types and mathematical functions. For example, an "XY" plot in 1-2-3 is called a "Scatterplot" in *BPS Business Graphics* and a "Scatter Chart" in *Chart-Master*. The table is arranged so that comparable functions appear on a single horizontal line.

The available graph types are roughly comparable in the two programs. Both programs improve on 1-2-3, and they both provide a selection of the most common graph

Review

1-2-3	BPS Business Graphics	Chart-Master
—	Amdek DXY-100	—
—	Amdek Amplot II	Amdek Amplot II
—	Anadex DP9001A/9501A	—
Anadex DP9520A	Anadex DP9620A	—
—	Apple Color Plotter	Apple Color Plotter
—	Apple Dot Matrix Printer	—
—	Apple Letter Quality Printer	—
—	C. Itoh Prowriter 1550	—
—	—	C. Itoh Prowriter CX-4800
—	CalComp M84	CalComp M84
—	Centronix 122/352/353	—
—	—	Data South DS180
—	Diablo 630/1610/1620/1630	—
—	Diablo 1640/1641/1650	—
Epson FX-80	Epson FX-80	Epson FX-80
—	—	Epson FX-100
Epson MX-80/MX-100	Epson MX-80/MX-100	Epson MX-80/MX-100
—	Hewlett-Packard HP7220	Hewlett-Packard HP7220B/C/S/T
—	Hewlett-Packard HP7221	Hewlett-Packard HP7221B/C/S/T
—	Hewlett-Packard HP7225	Hewlett-Packard HP7225/17603/17604
Hewlett-Packard HP7470A	Hewlett-Packard HP7470A	Hewlett-Packard HP7470A-Option 001
—	Hewlett-Packard HP7475A	Hewlett-Packard HP7475A
—	—	Hewlett-Packard 7550 Plotter
—	—	Hitachi 671-10/671-20
—	IBM 80cps	Houston Instrument DMP29/DMP40/DMP41
IBM Graphics	IBM Graphics	—
—	IBM XY-749/XY-750	IBM Graphics
—	IDS 440G/445G	IBM XY-749/XY-750
—	—	—
—	IDS Prism 80/Prism 132	IBM 7371 Plotter
—	IDS Microprism	IBM 7372 Plotter
—	Mannesmann Talley MT160/PIXY1	IDS Prism 80/Prism 132
—	Mannesmann Talley PIXY3	—
—	NEC 3510/3550	Mannesmann Talley PIXY3
—	—	—
NEC 8023	Okidata 82A/83A	—
Okidata 82A/83A	Okidata 82A/83A	Panasonic VP-6801
—	Okidata 92/93	Panasonic VP-6802
—	Panasonic VP-6801	Polaroid Palette
—	—	—
—	Qume Sprint 5-45/5-55	Roland DXY-800
—	—	Six-Shooter
—	Strobe 100	Strobe 100
—	—	Strobe 200/260
—	Sweet-P 100	Sweet-P 100
—	Watanabe WX4633/WX4634	—
—	Watanabe WX4635/WX4636	—
—	Watanabe WX4637/WX4638	—
—	Watanabe WX4671/WX4675	—
—	Xerox 1710/1720/1730	—
—	Xerox 1740/1741/1750	—
—	—	Yokogawa PL-1000/PL-2000

Table 2: Output device support compared. When you use presentation graphics packages, the quality of the printer and plotter can make all the difference.

types. None of the programs approaches the state of the art in contemporary graphic representation found on minicomputers and mainframes (for example, in the statistical program *MINITAB*), but the stock of graph types is probably sufficient for most business purposes.

BPS Business Graphics is slightly richer than *Chart-Master* in its ability to fit curves and to generate functions. In both programs these features are easy to use but relatively

BPS Business Graphics stores data for each variable in a different file.

inflexible. You would have difficulty, for example, developing a curve based on a subset of values of a variable: the functions must be based on all the data for a variable. The Mean Pre Drug curves in Figures 1, 2, and 3 are examples of applications for which this capacity is desirable. These averages had to be created in the 1-2-3 spreadsheet and then transported into the graphics programs.

Table 2 shows that the two graphics programs support a tremendous variety of output devices. While version 1A of 1-2-3 supports 9 printers and plotters, *Chart-Master* supports over 40 and *BPS Business Graphics* supports over 60.

Figures 1, 2, and 3 were all produced on an Epson FX-80. The 1-2-3 printout (Figure 1) was produced using the printer's quad-density mode. The *Chart-Master* and *BPS Business Graphics* printouts (Figures 2 and 3) were generated by reproducing the high-resolution graphics screen image. These figures represent the best dot matrix print quality possible with each program.

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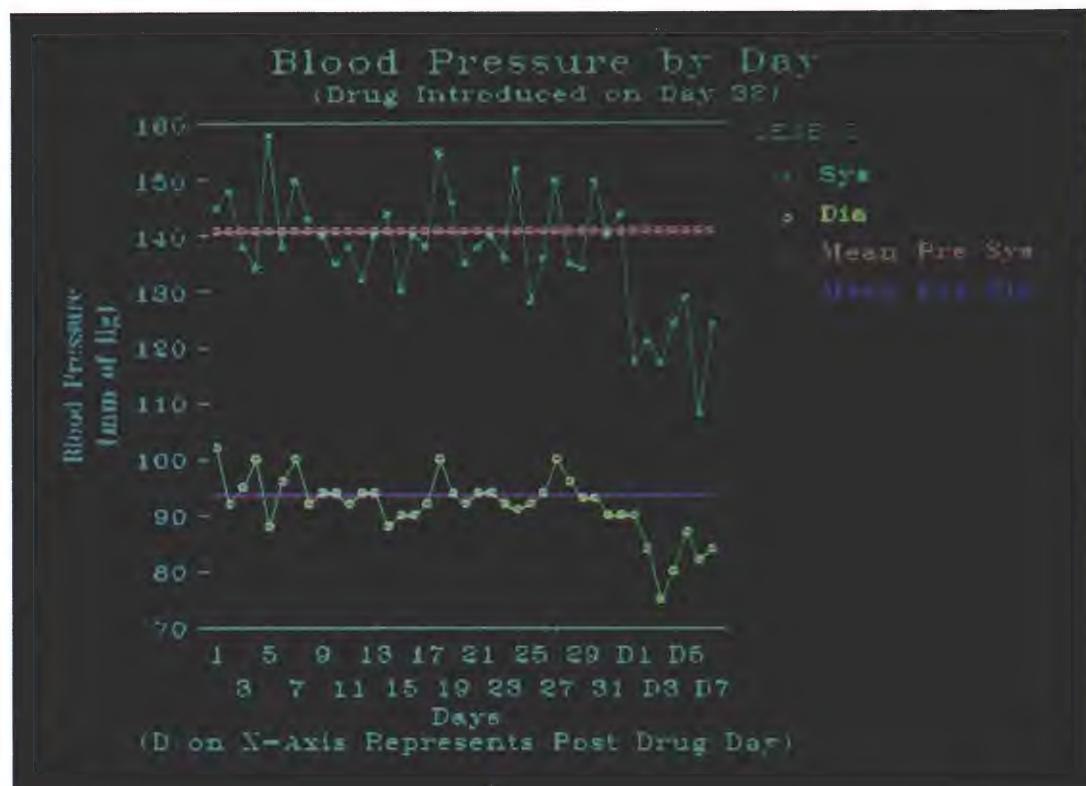
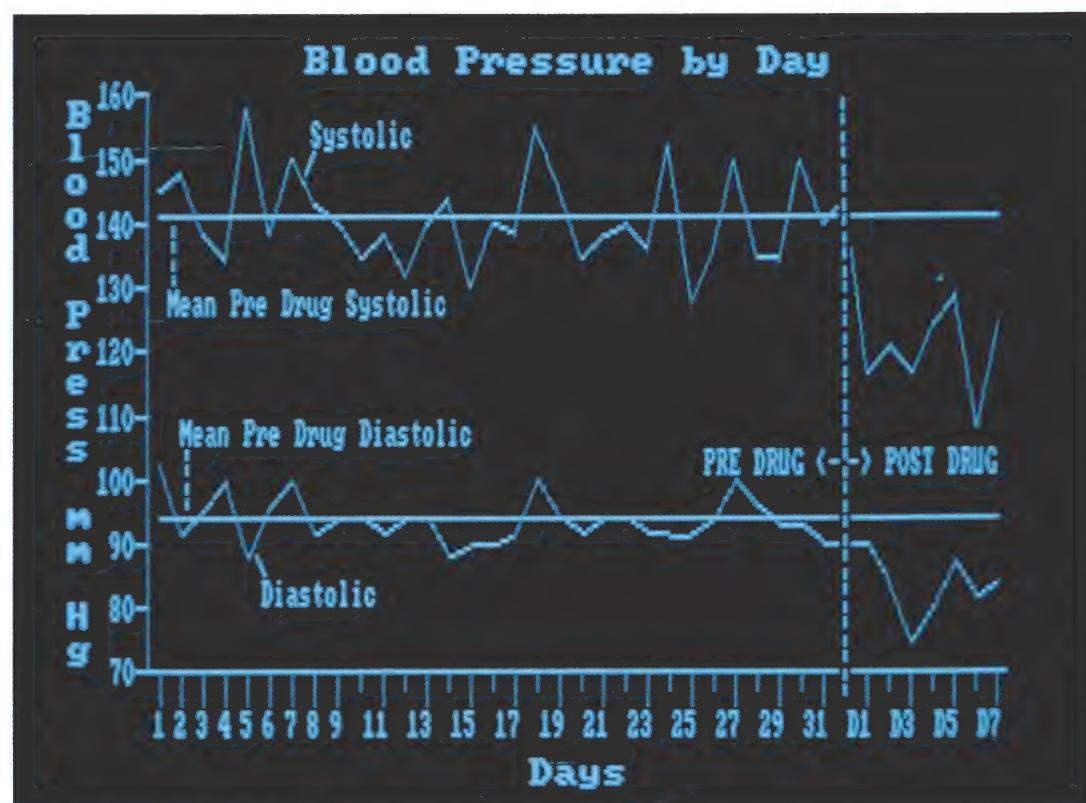


Figure 4:
Chart-Master
chart shown on
a slide generated
by the Polaroid
Palette

Figure 5:
BPS Business
Graphics chart
shown on a slide
generated by the
Polaroid Palette



1-2-3 generated the highest-quality printout on the Epson. The *Chart-Master* printout was marginally acceptable, and the *BPS Business Graphics* printout was too crude to serve as anything but a guide for a draftsperson; the characters are poorly formed, and the lines and curves are ragged. Given the quality of the 1-2-3 plot, it is obvious that the problem does not lie with the printer but with how the printer is supported by the program.

Figures 4 and 5 show the same charts as Figures 2 and 3, but they are saved as slides with the Polaroid

BPS Business Graphics contains a powerful batch capability.

Palette instead of printed on an Epson FX-80. The slides show an improvement in quality. You may need to use a slide generator or a plotter to produce presentation graphics of acceptable quality. Before you choose a package, you should insist on a demonstration using your particular output device.

In summary, both graphics programs are superior to 1-2-3 in creating presentation graphics. *Chart-Master* has the edge in ease of use for the novice. Its menu-driven operation is straightforward and there is little need for supplementary documentation. *BPS Business Graphics* has

more power and flexibility; the implementation of floating titles and legends is particularly notable, and the program provides more plotting functions. Either program is worthy of consideration as a supplement to 1-2-3 if you do not intend to produce your final output on a dot matrix printer. ■

Burton L. Alperson, Ph.D., is a Contributing Editor to PC World.

BPS Business Graphics
Business & Professional Software,
Inc.
143 Binney St.
Cambridge, MA 02142
800/342-5277
List price: \$350
Requirements: 128K, two disk drives,
color graphics board, color
monitor

Chart-Master
Decision Resources
25 Sylvan Rd. S
Westport, CT 06880
203/222-1974
List price: \$375
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MONTHLY PYMT	1037.54												
PRINCIPAL	543.54	549.43	555.38	561.40	567.48	573.63	579.84	586.12	592.47	598.89	605.38	611.94	6925.49
INTEREST	494.00	488.11	482.16	476.14	470.06	463.91	457.70	451.42	445.07	438.65	432.16	425.60	5524.99
INSURANCE	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	720.00
MAINTENANCE	60.00												
SALES TAX	3398.50												
PROPERTY TAX	60.00												
DEPRECIATION	570.00												
RESIDUAL VALUE	0.00												
INSTALLATION	470.00												
DOWN PAYMENT	2400.00												
ITC	4800.00												
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AFTER TAX OUTFLOW	-1090.21												
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More Color Than Big Blue

Two new graphics boards for the PC that beat IBM at its own game

David McCune

IBM did not make it easy for the businessperson to produce graphics on the IBM PC. One of the most popular PC video options, the IBM Monochrome Display, is best suited for processing text and numbers. The Monochrome Display is driven by the Monochrome Display Adapter—a circuit board that plugs into one of the PC's expansion slots. The two together produce extremely sharp, flicker-free green characters on a black background, 80 characters wide by 25 lines long. As an extra bonus, the monochrome board includes a built-in parallel printer port. Although the monochrome monitor and monochrome display board are a superior combination, they cannot produce color, and their smallest graphic elements are fat, mosaic-like rectangles and lines. A pie chart drawn with these graphic elements ends up looking like it is made of bricks.

Of course, you are not obliged to buy the monochrome monitor and board; IBM sells a color graphics board (without a parallel port) and a color monitor. With these you can

create color charts and other graphics and use two different screen resolutions. Resolution refers to the number of pixels (picture elements) that make up the images on the display. The smaller and more densely packed the pixels, the higher the resolution and the smoother the lines and characters appear.

The text displayed by the IBM Color/Graphics Adapter and monitor is a boon only to opticians.

Most business graphics packages work in medium resolution (320 by 200 pixels) and can use four colors at the same time. The background color is chosen from a predefined set of 16 colors; the three foreground colors can be either green, red, and brown or cyan, magenta, and white. If you want to create your own color, such as orange, you're out of luck. In high-resolution mode (640 by 200 pixels) you can draw much smoother

circles and diagonal lines—but only in black and white. Computer-aided designers often need high resolution for drafting, but they must sacrifice all color capability. The IBM Color/Graphics Adapter does have a 100-by 160-pixel, low-resolution mode with 16 simultaneous colors, but it is not well implemented by IBM and is seldom used.

The disadvantages of the IBM Color/Graphics Adapter are considerable. The text displayed by the board and monitor is a boon only to opticians. The characters are lit in an 8-by 8-pixel matrix, compared to the 9 by 14 matrix of the monochrome adapter, and are accordingly fat and fuzzy. When the screen scrolls, it quickly flashes off and on, producing an annoying flicker.

The board's cost can be a problem, too. The Color/Graphics Adapter's lack of a parallel port may eventually force you to buy a separate board for this function, and the Color/Graphics Adapter requires an expensive RGB color monitor. (RGB stands for red, green, and blue and refers to the way the board and monitor encode and decode color information.) The IBM Color/Graphics Adapter also has a

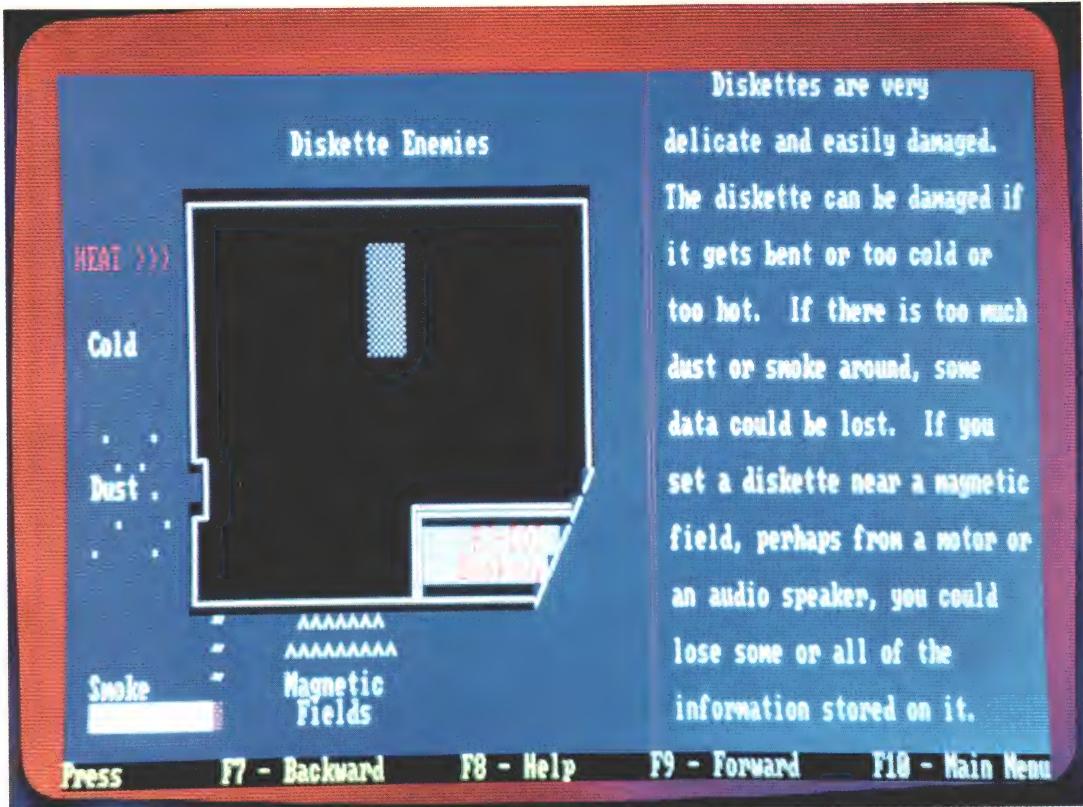


Figure 1:
A medium-resolution graphic produced by the PC Peacock

"composite video" color output, which connects to cheaper composite color monitors. But compared to the RGB signal, the IBM board's composite video signal is abysmal; even large, 40- by 25-pixel characters are often illegible, blurry masses when displayed on a composite monitor in medium-resolution mode.

Dual Solution

The only reasonable solution for someone who stares at text and numbers for most of the day but occasionally produces graphics is to buy both the monochrome and color graphics boards and monitors. That's reasonable, of course, only if your budget allows.

Enter the third-party vendors, the companies that fill the technical and marketing gaps left by the IBM giant. These companies prosper only as long as their products beat IBM's price and performance or offer features not available from IBM. Two

products that fit this bill are the PC Peacock graphics board from MA Systems and the Graphix Plus II board from STB Systems. The PC Peacock simply replaces the IBM Color/Graphics Adapter. The Graphix Plus II, on the other hand, is a complete monochrome board that produces medium- and high-resolution graphics on a monochrome monitor and a nearly complete color graphics board that produces enhanced medium- and high-resolution color graphics.

PC Peacock

If you are about to add color to your PC, you would do well to consider the PC Peacock. The board includes two 80- by 25-pixel text fonts—one, thankfully, more legible than the IBM Color/Graphics Adapter font.

The PC Peacock also comes with a parallel port—all for \$299, which is a savings of \$95 over a similar IBM configuration.

The PC Peacock is actually two full-length circuit boards sandwiched together. This "biplanar" design is surprising when you consider that the Peacock does little more than the IBM graphics board. An engineer at MA Systems explained that the company originally planned a board with double the RAM of an IBM Color/Graphics Adapter in order to generate 16 simultaneous medium-resolution colors—a task requiring two printed circuit boards. MA Systems later dropped the idea but kept the board structure. Luckily the Peacock can squeeze into one PC slot without nudging adjacent boards. The fit is tight, however, and heat dissipation may be a problem if you have a number of expansion boards already installed.

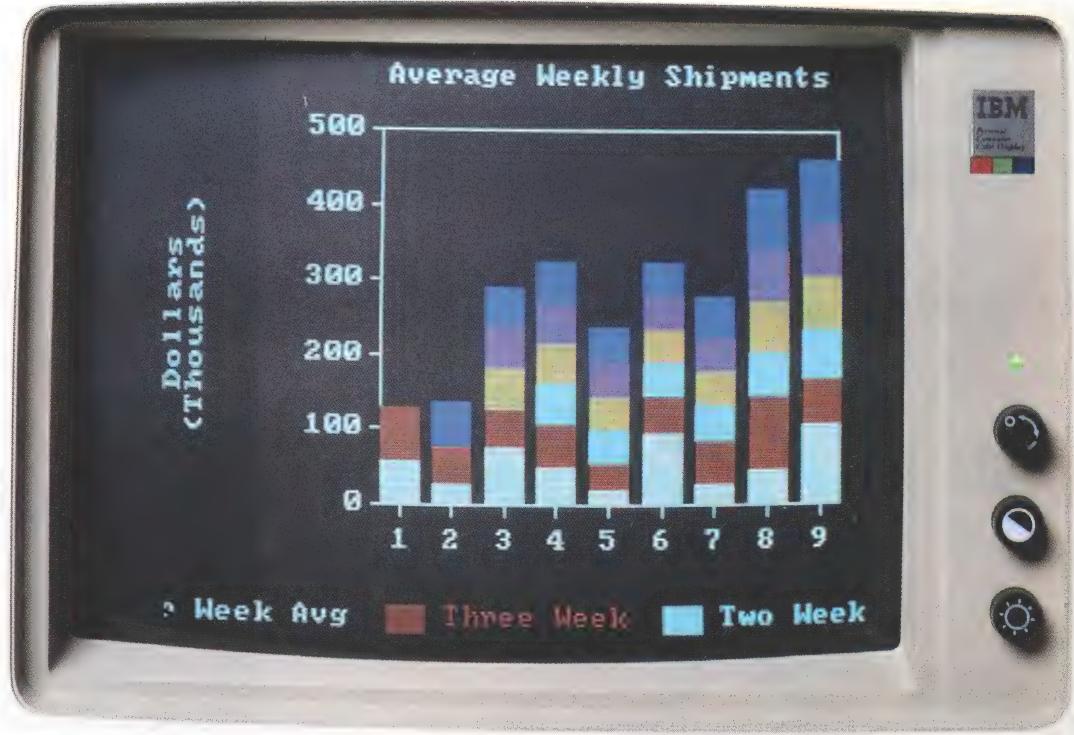


Figure 2: A 1-2-3 graphic displayed in medium resolution by the Graphix Plus II. Sixteen colors are possible, but only eight are displayed because of 1-2-3's limitations.

With the exception of a green jumper wire soldered across the board, the Peacock appears to be built well. Installation is easy, due largely to exemplary instructions. The Peacock's manual is one of the few I've seen that doesn't assume you open PCs and install circuit boards for a living. The manual's many clear diagrams show you how to do everything from finding the cover screws on the PC to finding and setting switches on the computer's motherboard.

Once installed, the PC Peacock precisely emulates the medium- and high-resolution graphics of the IBM Color/Graphics Adapter (see Figure 1). Programs such as 1-2-3, *Graphwriter*, and *Flight Simulator* produce graphics as they would with the IBM board. Unfortunately, the manual is inaccurate in describing the board's medium-resolution capabilities, repeatedly claiming that the Peacock "offers multicolor graphics with four

foreground colors" displayed simultaneously against one background color. Like the IBM Color/Graphics Adapter, the PC Peacock can display only three simultaneous foreground colors and one background color in medium-resolution mode.

The Peacock's composite color output is much better than the IBM board's. Colored text on a colored background in medium-resolution mode is readable, though 80- by 25-pixel characters are not very legible. For text editing an RGB color monitor is still preferable.

The PC Peacock's RGB output is likewise superior to the IBM board's, and the displayed characters are lean and crisp, once you fiddle with a jumper plug on the board. When this small connector is removed from the board, the 80- by 25-pixel font gets sharper. If you prefer fat and fuzzy characters, you can, of course, replace the jumper. The manual gets this procedure backward, stating that the slimmer font appears when the jumper is in place.

Keep in mind that the PC Peacock will not run the IBM Monochrome Display, though it will run single-color monitors that accept composite signals. And if you are already using the IBM Monochrome Display Adapter, you can still easily install the PC Peacock to run a color monitor. If there is already a parallel port installed (addressed by DOS as LPT1:) such as the one built into the IBM Monochrome Display Adapter, the PC Peacock will automatically assign its parallel port to LPT2:.

Is the PC Peacock for you? If you get a PC and plan to use only a color monitor with it, the PC Peacock is a good buy, since it matches or outperforms the IBM Color/Graphics Adapter and has a parallel port. You may find the PC Peacock's font good enough that you will not feel compelled to buy a monochrome board and monitor for text processing. If

you already own a monochrome board, however, and just want to add color to your PC, the PC Peacock is less attractive. Its parallel port is superfluous since the IBM monochrome board has one.

The only relevant difference between the PC Peacock and the IBM Color/Graphics Adapter, excluding the parallel port, is the PC Peacock's better color composite output. It's unlikely that you can live with the medium-resolution color characters and graphics produced by the PC Peacock on a composite monitor, but if you can you might not have to buy a more expensive RGB monitor.

Graphix Plus II

Any way you look at it, in terms of performance or cost, the Graphix Plus II from STB Systems is a champion. With only a few minor reservations, I would advise anyone about to buy a PC to get the Graphix Plus II instead of IBM's monochrome or color graphics boards. The Graphix Plus II beats both.

The Graphix Plus II fully uses the text and medium- and high-resolution graphics capabilities of the IBM Monochrome Display. It also completely emulates the RGB graphics capabilities of the IBM Color/Graphics Adapter. Sixteen simultaneous colors are available in medium-resolution mode (see Figure 2); four simultaneous colors are available in high-resolution mode. The board comes with a built-in parallel port and a battery-powered clock; STB also throws in print spooling software and a package that lets you create two simultaneous disk emulators. The Graphix Plus II's only limitations are that it does not produce color composite output and cannot display graphics on a monochrome and a color monitor at the same time.

A caveat is in order here. The Graphix Plus II reviewed was a pre-release version. The software interface to the board's enhanced graphics functions was not finished, and the

documentation was still the preliminary version and thus sketchy. Nevertheless, after hours of using this product's graphics features, I came away convinced of its power and versatility.

The Graphix Plus II is sturdily built, with the exception of the AA-size battery holder that dangles from a few inches of cable. (The battery powers the clock.) The battery holder is backed with a cheap adhesive strip, and the implication is that you should secure it somewhere in the PC; the only available space is on the back wall of the system unit.

Installation is easy, though I hope that future documentation will include more illustrations. This would be particularly helpful for finding and setting the eight switches on the Graphix Plus II board and the corresponding switches on the PC motherboard that must be set for the monitors and other boards you want to use. The documentation should also remind users to ground themselves before installing the Graphix Plus II, which like any similar device is sensitive to static electricity.

The board's capabilities are quickly evident when it is connected to both a color monitor and an IBM Monochrome Display. The PC automatically boots up in monochrome mode; to change monitors, you must use DOS's MODE CO command. The board's monochrome display is superb, with solid high-resolution characters that scroll without a trace of flicker. When I switched to a color monitor, I discovered that the character font was identical to the IBM Color/Graphics Adapter's 80- by 25-pixel font. But what a surprise when text scrolled smoothly up the screen! The bothersome flicker common with the IBM board was absent.

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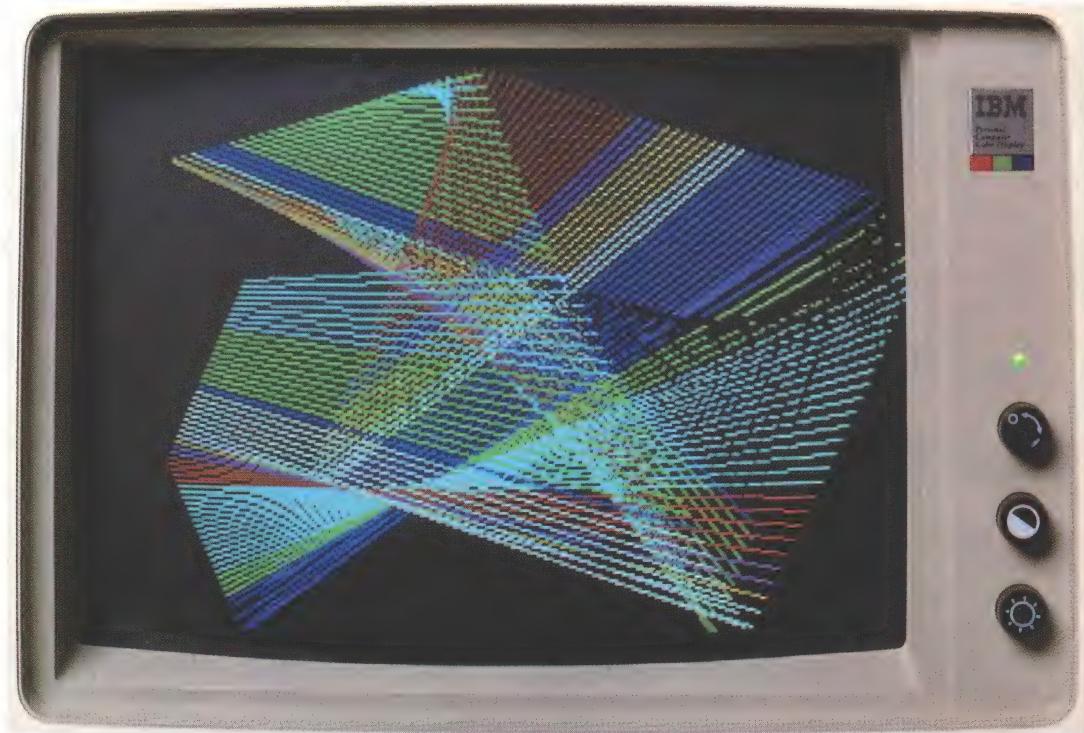


Figure 3: A 16-color medium-resolution graphic generated by the Graphix Plus II

At this point I tested various graphics packages, including *Flight Simulator*, *1-2-3*, *Graphwriter*, and a public domain version of Logo called Ladybug that switched back and forth between both monitors. With the notable exception of *1-2-3*, the programs produced graphs on both the color and monochrome monitors. When the Graphix Plus II switches between color and graphics modes, the inactive screen goes blank. On a PC with both IBM boards installed, the last image on the inactive screen continues to be displayed. I know of no software that relies on this feature, though programmers might find it useful.

The only IBM Color/Graphics Adapter feature not emulated by the Graphix Plus II is color composite video. The board supplies a composite video output, but all color information has been stripped out and

the colors are displayed in shades of gray on a composite monitor. This is not necessarily a fatal limitation if you consider the blurry characters the IBM Color/Graphics Adapter displays in composite mode. The characters and graphics produced by the Graphix Plus II's composite signal are nearly as sharp as their RGB counterparts. The only problem is the "snow" that appears whenever 80-column text is scrolled.

With the Graphix Plus II, graphs and charts are within your grasp, even if a \$680 color monitor is not. While color is an asset to any graphic, medium- and high-resolution monochrome graphics can do the job.

The IBM Monochrome Display's lack of color is not as limiting as it might seem. The goal of most business graphics packages such as *1-2-3* or *Graphwriter* is to print out graphs and charts for inclusion in reports. The main purpose of displaying

graphs and charts on a monitor is to allow you to preview your work before sending it to the plotter or printer. Since this can be done just as well in green and black, and since most color monitors cannot match the resolution or colors that many programs generate and many printers, plotters, and slide generators produce, you may find an IBM Monochrome Display and a Graphix Plus II board sufficient for your business graphics.

Be prepared for the color graphics on a monochrome monitor to look a bit squashed along the vertical axis—the IBM Monochrome Display's vertical resolution is 350 pixels and the Color/Graphics Display's is 200. A picture will only appear 57 percent as high and 89 percent as wide as it

should be, but it will print out in its proper dimensions. Given this distorted display, you will not want to edit 80- by 25-pixel text in monochrome graphics mode, but you can switch back to the text mode's high-resolution font with DOS's MODE MONO command.

Setting the screen's border as any color other than black throws the display into a tumult of irregular diagonal lines.

The only monochrome graphics bug appears when the screen's border area is set to a color other than black. This throws the display into a tumult of irregular diagonal lines, making any graphics or text illegible. Note too that 1-2-3 will not work when the board is set up to switch between color and monochrome monitors.

Graphix Plus II's enhanced graphics—more simultaneous colors in medium and high resolution (see Figure 3)—are impressive but may not be terribly useful at this point. Sixteen-color graphics in medium resolution are breathtaking but also painfully bright. The prospect of four-color graphics in high-resolution mode is more interesting, but users won't receive any benefits of this graphics power until STB supplies a thorough technical manual and a broad library of support software such as assembler subroutines and extensions to BASIC for programmers creating software for the board. At the time of this review, such software was unavailable, though STB notes it will be on the market when the Graphix Plus II is commercially released.

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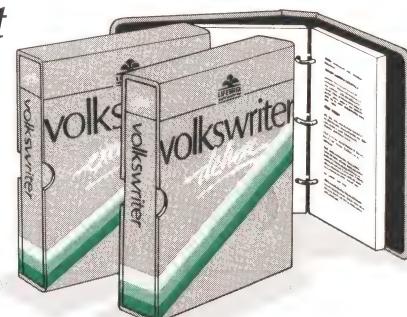
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● Review

The biggest potential problem for the Graphix Plus II—one that all enhanced graphics boards face—is the lack of standardization of enhanced graphics features. Until IBM unleashes its own high-resolution color

While the Graphix Plus II is a superior replacement for the IBM boards, don't expect to produce ten-color pie charts in the near future.

graphics board, every third-party vendor will come up with its own way of organizing the PC's video memory and communicating with the 6845 CRT controller chip that drives nearly all PC display boards. As long as this video chaos reigns, software houses will be reluctant to modify their products to accommodate this or any other enhanced graphics board. So while the Graphix Plus II is a superior replacement for the IBM monochrome and color graphics boards, don't expect to produce ten-color pie charts in the near future.

Graphix Plus II is a superior product, offering an extraordinary economy of both money and space. You get a monochrome board and a color graphics board, a parallel port, and a battery-powered clock for much less than the comparable IBM boards would cost while only using one of the PC's scarce expansion slots. Graphix Plus II can do double duty

as both a monochrome and a color graphics board, and it is versatile enough to replace only one of those boards and happily coexist with the other in the same PC—not an easy feat, since graphics boards tend to fight over the same memory location or parallel port.

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David McCune is president of The Proteus Group, Inc., a New York consulting firm.

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MA Systems
2015 O'Toole Ave.
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408/943-0596
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Requirements: 64K

Graphix Plus II
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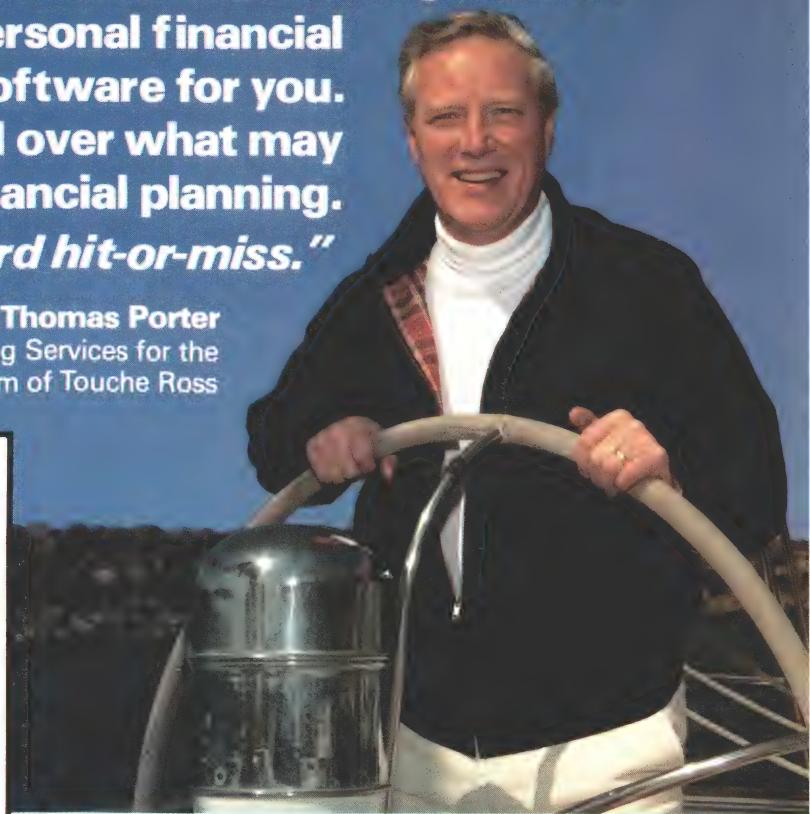
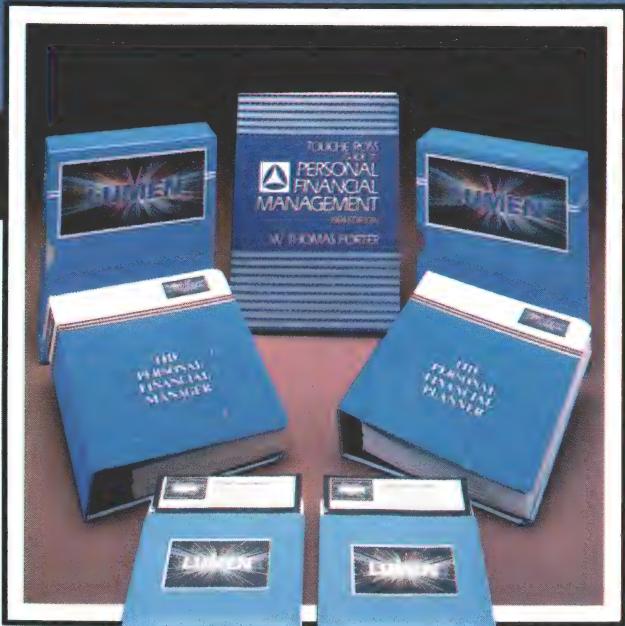
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PCWD 8/1

From the Software Shelf

First impressions of recently released software products

Edited by Robert Luhn

From the Software Shelf samples a small portion of the many software programs flooding the PC market. These reviews—written by the staff of *PC World*—provide a brief glimpse at new word processors, spreadsheets, data base management programs, utilities, tutorials, and other products, including new additions to established software families, that might otherwise be overlooked. These impressions are not intended to take the place of a full length review of the product but rather to keep you informed of new products that we think will be of interest. *From the Software Shelf* examines programs for ease of use and installation as well as for the strong features or most significant weaknesses of these contenders for future software fame.



Harvard Project Manager

Can a PC help me organize and keep track of projects? Sophisticated project management techniques designed for large engineering projects such as the Alaska pipeline have recently been adapted for use on microcomputers. Project management software can be invaluable for keeping track

of large and complex projects. For small projects, however, you may find yourself spending a lot of time learning and using a program when manual methods may be adequate.

Using the Critical Path Method (CPM) and Program Evaluation Review Technique (PERT), the *Harvard Project Manager (HPM)* helps you organize a project into orderly segments, identify critical dates and interrelationships between the tasks that make up the project, and calculate costs and time requirements. You enter project tasks into a PERT diagram, which is a flow chart that shows the order and interrelationships of steps in a project. The program generates a schedule showing a project's critical path—those tasks whose completion is essential to the timely completion of the entire project.

The *HPM* does a nice job of crunching numbers and visually organizing dates. As start or stop dates and related costs are changed for a task, the program automatically adjusts dates and costs for the entire project. The *HPM* allows you to structure the project's calendar to account for holidays and unusual work weeks. You can print the PERT diagram, the schedule, the calendar, and information reports using normal page orientation or sideways for continuous printing of long graphics.

The *HPM* does a terrific job of managing information in windows. The opening menu displays four windows: a "roadmap" (PERT chart), a schedule (bar chart), a calendar, and

a function menu. Any window can be called up while you are using another. While entering tasks on your roadmap, you can call up a "forms" window and enter names, descriptions, dates, and other information about specific tasks. Pressing <Enter> returns you to the roadmap. The program's disk tutorial also makes full use of *HPM*'s windowing capabilities, explaining lessons in one window while executing them in another.

Keeping keyboard commands straight can be difficult. There are three types of cursor commands you need to remember: the <Backspace> key and <Space> bar control major function selection, the arrow keys control selections within a function, and the <Tab> key is used for editing project and task descriptions. The *HPM* command line is similar to 1-2-3's, allowing you to make your selection by typing the first letter of a command or by moving the cursor to the desired command and pressing <Enter>. Unlike 1-2-3, however, cursor movement is controlled not with the arrow keys but with the <Space> bar and the <Backspace> key—a convention that might be confusing for 1-2-3 users.

HPM's strengths are its abilities to monitor and track potentially unwieldy projects and calculate dates and costs as you add or change data, but *HPM* does little to help you plan a project in its early (critical) stages. You are obliged to sit down with a notepad and pencil and figure things out—in fact, *HPM*'s documentation includes two drawings of a project organized on paper just to give you the right idea. For large and complex

projects, especially those that have benefited from manual project management techniques in the past, the *Harvard Project Manager* could be a valuable investment.—RM

Harvard Project Manager
Harvard Software Inc.
Software Park
Harvard, MA 01451
617/456-3400
List price: \$395
Requirements: 128K, two disk drives,
printer with graphics capability



CorrectStar

I hate to brag, but I was the spelling bee champ throughout grade school, my reign cut short only by adolescent indifference to such insipid competitions. Given my natural talent, do I need a \$195 spelling checker? Of course, there are those poor unfortunates who cannot spell "occurrence" to save their lives, and they may need such a program. With both viewpoints in mind I looked at *CorrectStar*, a new addition to the Mi-

croPro family, known mostly for its wildly popular *WordStar* program.

CorrectStar has some impressive features. It not only points out spelling errors but does a fast phonetic and alphabetic search for the right word through a three-part dictionary system. The 65,000-word Main Dictionary file is on a different disk than the *CorrectStar* program. Although you cannot edit or expand this dictionary, you can add Personal Dictionary files with up to 1500 words of your choice in each file. The *CorrectStar* program disk also contains an Internal Dictionary file, a 9000-word subset of commonly used words from the Main Dictionary that is loaded into the computer's random access memory (RAM) for quick operation.

Although I have another natural talent—for eliciting software bugs—I had no problems running *CorrectStar*. The training guide and reference manual includes easy installation instructions. One step in the procedure requires copying the *CorrectStar* program onto a *WordStar* 3.3 disk. The *CorrectStar* option then conveniently appears on *WordStar*'s main menu. One keystroke takes you from *WordStar* to the spelling checker. You're ready to go after obeying a prompt to remove the *WordStar* disk and insert the Main Dictionary disk in drive A:.

To operate the spelling checker you simply choose one of eight on-screen menu options—*CorrectStar* does the rest. Any "suspect" misspelled word is displayed at the top of the screen and also highlighted in the text; *CorrectStar* then offers a list of alternative words that closely resemble it. The correct word will usually appear at or near the top of the list. For the misspelled word *kur*, *CorrectStar* provided seven choices including *car*,

corps, and the correct word *cur*. You must decide whether the suspect word is incorrect and then choose the correct word from the list. One menu option will insert a corrected word into the text and reform the paragraph to maintain the proper margins.

One annoying limitation of the program is that you cannot jump forward or backward in the text but must proceed from the beginning to the end of the document. If you exit to *WordStar*, pressing <Ctrl>-L will return you to *CorrectStar* and relocate the cursor at its last position.

Given the manufacturer's claim that *CorrectStar* "helps produce letter-perfect documents," I tried a simple spelling test. Out of 34 spelling errors and typos in two paragraphs, *CorrectStar* corrected 23 errors and missed 11. However, numbers alone do not tell the tale. Two of the 11 words with errors were homophones (*steel* instead of *steal*, for example) so only a program that could understand a word's meaning in context would spot the error; six were words correctly spelled but incorrect in context, such as *gun* and *gory* instead of *gum* and *glory*. The three remaining errors were uncapitalized words such as *indiana*, which illustrates that *CorrectStar* doesn't recognize uppercase or lowercase letters.

CorrectStar shines when it comes to speed and ability to correct nearly unrecognizable words. I was pleased that *mirdur* and *purrfect* were changed to *murder* and *perfect*, but I was completely won over when *mircennerry*, *tiranicle*, and especially *arkelogle* were immediately recognized and corrected.

From the Software Shelf

Two conclusions can be drawn from this unscientific survey. First, *CorrectStar* is a handy tool for good spellers who are lousy typists or for anyone who must correct somebody else's mangled spelling in a document. Second, the program, like most spelling checkers, does not check for incorrect word usage or punctuation errors, so careful proofing is still necessary. The moral of the story: You cannot rely on the computer to do all your work for you—so what else is new?—CW

CorrectStar
MicroPro
33 San Pablo Ave.
San Rafael, CA 94903
415/499-1200
List price: \$195
Requirements: 192K, two disk drives,
WordStar 3.3



Practical Accountant

I am not an accountant, but I do get perverse satisfaction from successfully balancing my checkbook. The challenge, of course, is matching my perception of reality with the bank's, an uneven contest pitting my scrib-

bles and check stubs against their mainframe computers. Now help is here in the form of *Practical Accountant*, a program designed primarily to do the books for a small business but also useful in organizing complicated personal finances.

Practical Accountant provides a cash record of income and expenses, including accounts receivable and payable. With DOS 1.10 or 2.00 and a double-sided disk you can enter up to 1500 or 1700 items, respectively, while a hard disk (under DOS 2.00) accommodates the entry of 35,000 items. You can create a chart of accounts with 50 categories and 400 subcategories; assign 24 tax classifications of your own choosing (such as deductible or nondeductible); reconcile a cash record; prepare and print cash flow and other reports; print checks; and choose customized program options, such as automatic date carryover for cash record entries.

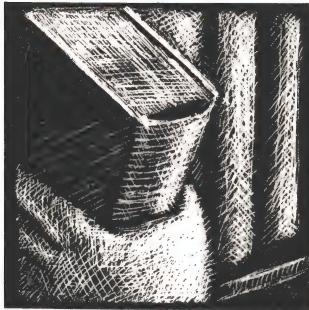
Practical Accountant's user manual, which includes a tutorial, is excellent. The manual is as concise as it is generous with reassurances, definitions of terms, diagrams of how the screen should appear at each step, and clear instructions on how to perform each function. The tutorial assumes no previous accounting or computer knowledge and is so well written that it is hard to make a mistake following its step-by-step instructions.

After graduating from the tutorial, you will find *Practical Accountant* is easy to use. The program is menu-driven, so its operation is straightforward once you have learned the rules in the tutorial. Major commands such as Save, Help, and Print are implemented with a single function key. Particularly useful is *Practical Accountant*'s continuous display of the running balance for the cash record items: current cash balance, accounts receivable and payable, projected and reconciled balances, and current number of entries.

Practical Accountant's low price and the ease of getting started are selling points if you haven't used a computer or an accounting program before. But before buying this program for your small business, make sure it satisfies your particular accounting requirements. In considering hardware requirements, note that *Practical Accountant* runs on the IBM PC, PCjr, PC XT, and most major PC-compatible computers.

You may be better off tracking relatively uncomplicated personal finances on paper. But if you have several incomes or need to track cash disbursement, *Practical Accountant* may make your life easier.—CW

Practical Accountant
Softlink Corporation
3255-2 Scott Blvd.
Santa Clara, CA 95051
408/988-8011
List price: \$149.95
Requirements: 128K, one disk drive,
printer strongly recommended



you can disconnect (saving line and subscription charges) and review your booty or, if you didn't find what you wanted, move to another data base while on line. In five minutes I had all the bibliographic information I needed covering both *Ulysses* and the *The Sound and the Fury*; in another five I had abstracts on the implications of treating humus with chlorine. Both searches would have consumed hours using a card catalog.

In-Search is elegantly designed and features 50K of on-line help, intuitive commands, and prompt windows that spring from the center of your screen. The user manual is thorough, though it has difficulty explaining the Boolean logic required by Dialog. When you are planning the structure of a search, the documentation nudges you in the implications of the connectives "and," "or," and "not" as deftly as Socrates evoked geometry from a slave. In short, *In-Search* makes a sizable collection of information available to amateurs and professionals alike, who need not become experts in computer programming or telecommunications.—JS

In-Search
Menlo Corporation
4633 Old Ironsides #400
Santa Clara, CA 95050
408/986-0200
List price: \$399
Requirements: 192K, two disk drives,
modem (any Hayes modem, Novation's Smartcat, or an acoustic
coupler)

In-Search

I've spent hours arguing that the microcomputer revolution is not comparable to that of the printing press. After experimenting with *In-Search*, I might change my mind. This program eases access to Dialog, the collection of over 200 information data bases covering engineering, science, medicine, business, government, and law (see "Dialog: The Ultimate Online Library," PCW, Vol. 1, No. 6). With *In-Search*, you can dial and log on to Dialog with one keystroke, retrieve references using intuitive commands, and print abstracts or save them on disk. Professionals will find *In-Search* more thorough and faster than spending an afternoon in their local card catalog or a half hour paging through recent journals. The program is also ideal for any curious soul who wants simply to pursue his or her own eclectic interests.

In-Search makes Dialog's data bases available to all takers—not just to libraries, institutions, or wealthy Ph.D. candidates. While once you had to master an arcane code, now Dialog's commands are abbreviated to simple menu options and function keys. *In-Search* lets you scan the contents of a data base and helps you structure your search. After it has retrieved all the items you've specified,



TenKey

For all its high-tech power, the PC cannot add, subtract, multiply, or divide without some sort of calculation program. If you've found space for an adding machine next to your PC, this may not be a problem. If you use 1-2-3 or a similar program, you can also do simple math without much fuss. But if you don't have an adding machine or if you don't happen to be using a spreadsheet at the moment you need to calculate something, you must exit the current application, swap some disks, and load a program to perform your calculations.

TenKey solves these time and space woes. Developed by Photon Software, the program essentially turns your PC into the electronic equivalent of the adding machine, complete with an on-screen "tape" that keeps track of previous calculations and results. In addition to the standard four arithmetic functions, *TenKey* offers percent; memory +, -, recall, and clear; clear entry; clear all memory; constant; and 14 different decimal settings.

TenKey comes as an .EXE file that is easily copied onto a DOS disk; you can write a simple batch file to load *TenKey* automatically along with DOS when you boot up your system.

From the Software Shelf

Since *TenKey* resides in memory (taking up either 9K or 23K), it's always available. If you need to check the numbers in a word processing document or want to perform a calculation while hip-deep in a data management operation, you don't have to search for an adding machine or run a separate calculation program. Hitting <Ctrl>-<Esc> opens a small *TenKey* window in whatever file you are working on and disables those keys not dedicated to *TenKey* functions. Press <Ctrl>-<Esc> again and *TenKey* disappears so you can continue with your work.

As the icing on the cake, *TenKey* lets you take the final result of a calculation and insert it where you left the cursor in a document. In short, *TenKey* is the program for anyone who has use for an adding machine but needs more desktop space.—RL

TenKey
Photon Software
P.O. Box 1408
Bellevue, WA 98009
800/426-2675, 206/451-8272
List price: \$48.50
Requirements: 64K, one disk drive



File Clerk * Congress

Since I correspond with members of Congress rather frequently (sometimes to praise, often to chastise), the appearance of *File Clerk * Congress* is something of a godsend. The program is just what any dedicated political letter writer needs: a complete data base of congressmen and congresswomen and senators that includes addresses, phone numbers, committee memberships, political parties, and more. *File Clerk * Congress* provides you with all this current information and the ability to alter the appropriate files as representatives change committees or assume leadership posts and as new representatives are elected and old ones are not. Information can be printed to screen, disk, or printer and selected according to a representative's state, committee, election year, house, party, or reference number; entire house memberships and committee lists (with specified ranges) can also be printed. A mailing label option is included with the package.

Configuring and running the program involve a bit of disk swapping; both BASIC and the program's batch files must be copied onto a DOS system disk; once you have started the system from this disk, you must remove it and insert the *File Clerk * Congress* program disk to begin work. Landrum Software claims that the next release of *File Clerk * Congress* will substantially reduce this disk juggling. If you use this program with a monochrome monitor, beware of Option 7, Reset System Colors, since almost any combination of text and background colors (other than white characters/black background) will turn your screen pitch black. Keep in mind too that since *File Clerk * Congress* is written in BASIC, it is sluggish and makes continual disk reads.

Nonetheless, the program does the job, and cheaply too. If you are a political organizer wanting to make your voice heard by 50 instead of 5 senators, *File Clerk * Congress* may well be worth the investment.—RL

File Clerk * Congress
Landrum Software, Inc.
P.O. Box 842
Palm City, FL 33490
List price: \$39.95
Requirements: 64K, BASICA, one disk drive



IFR-PC-1

For the fly-by-the-seat-of-your-keyboard pilot, Microsoft's *Flight Simulator* provides hours of no-risk thrills and imparts some essential education about the basics of flying. If you become intrigued enough to actually climb into a real cockpit and take flying lessons, you will find *IFR-PC-1* from Anderson Aviation not only the logical extension of *Flight Simulator* but a useful introduction to the complexities of flying a plane by instruments only.

Most private pilots who are licensed to operate single-engine airplanes such as the Cessna 150 or Piper Comanche do so under Visual Flight Rules (VFR); when the sun is out and visibility is acceptable, they are permitted to fly. But flying at night or in inclement weather usually requires the pilot to read instruments, which not only indicate altitude, orientation, and heading but allow the pilot to find the way from one place to another using a variety of radio beacons. To fly legally under low-visibility conditions, a pilot must be licensed under Instrument Flight Rules, or IFR.

IFR-PC-1 is a real-time simulation aimed at instrument-rated pilots who want to brush up on their skills, pilots seeking an instrument rating, or desk-bound aces anxious to get a taste of what instrument navigation is all about. Unlike *Flight Simulator*, the view of the world is restricted to an instrument panel. After specifying airspeed, heading, wind direction and speed, turbulence, and fuel level, you set off on a cross-country journey, navigating by compass and radio beacons and eventually landing at an airport—all by instruments.

As with *Flight Simulator*, the airplane is controlled with cursor and function keys. You can bank, dive, or climb, play with the throttle, lower or raise the landing gear, set flaps, and change the settings on navigational radios. Your progress (and how your actions affect fuel consumption and heading) are monitored on a number of instruments that indicate heading, airspeed, altitude, climb rate, turning rate, engine RPM, flap and landing gear position, and fuel level.

Though *IFR-PC-1* is good clean fun for the earthbound, keep in mind that it's primarily designed for private pilots. If you've never flown before and want to get the most out of this package—namely its radio navigation features—I recommend that you go beyond the user manual and read up on the subject of aerial navi-

gation. For the pilot using this package, the user manual should prepare you sufficiently for flying and—hardest of all—landing by instruments.

—RL

IFR-PC-1

Anderson Aviation, Inc.

333 Moore House Rd.

Yorktown, VA 23690

804/898-5699

List price: \$49.95

Requirements: 64K (with DOS 1.0 or 1.10) or 128K (with DOS 2.00 or 2.10), one disk drive, graphics board



Training for the dBASE II Program

I often wonder if I'm the only one who doubts the value of most tutorials. As it happens, most of my fellow editors agree that a *WordStar* tutorial has yet to arrive that cannot be abandoned in favor of the program's own help menus. Tutorials tend to address you in a condescending tone, overemphasize basic principles, and

From the Software Shelf

then fade just when you are ready to use the program's more useful features. Cdex Corporation's *Training for the dBASE II Program* is no exception.

dBASE II is a problem unto itself. It is a widely used data base manager, but it has none of the progressive features of its more recent competition: menus, help screens, or a query language that resembles English usage. To its credit, the Cdex tutorial did teach me how to create a simple file, display selected records, and sort them in elementary ways. I also learned how to manipulate multiple data bases, albeit in a limited manner.

I understand most *dBASE II* tutorials waste a great deal of time teaching data entry, and I was relieved to find the Cdex tutorial more sophisticated than that. However, when it comes to writing command files (the *dBASE* equivalent of programming), the tutorial falls apart. It presents a few commands with little indication of how to use them. Most learning theory confirms my suspicion that people learn by tackling concepts or solving problems rather than by memorizing isolated pieces of information. Although it attempts to teach the user how to write command files, *Training for the dBASE II Program* falls short in this area.

The tutorial is essentially an electronic workbook with a few simple graphics, an annoying beep or two, and some condescending questions. Unlike a workbook, however, you

cannot go back a page. Haven't the folks at Cdex heard of <Esc>? The tutorial does not work interactively with *dBASE II*, so each time you leave the tutorial for prescribed exercises, you must enter *dBASE*, do the exercise, exit, and reboot the tutorial. Each time you reenter the tutorial you are required to start from the beginning, flip past copyright information and the introduction, and type in your name. When you are working in the more advanced chapters, this becomes a real nuisance because the second and third disks do not include the operating system.

For all its deficiencies, *Training for the dBASE II Program* does give you some fundamentals in data base management with this most popular data base management program.—JS

Training for the dBASE II Program
Cdex Corporation

5050 El Camino Real

Los Altos, CA 94022

800/982-1213, 415/964-7600

List price: \$69.95

Requirements: 64K, one disk
drive 

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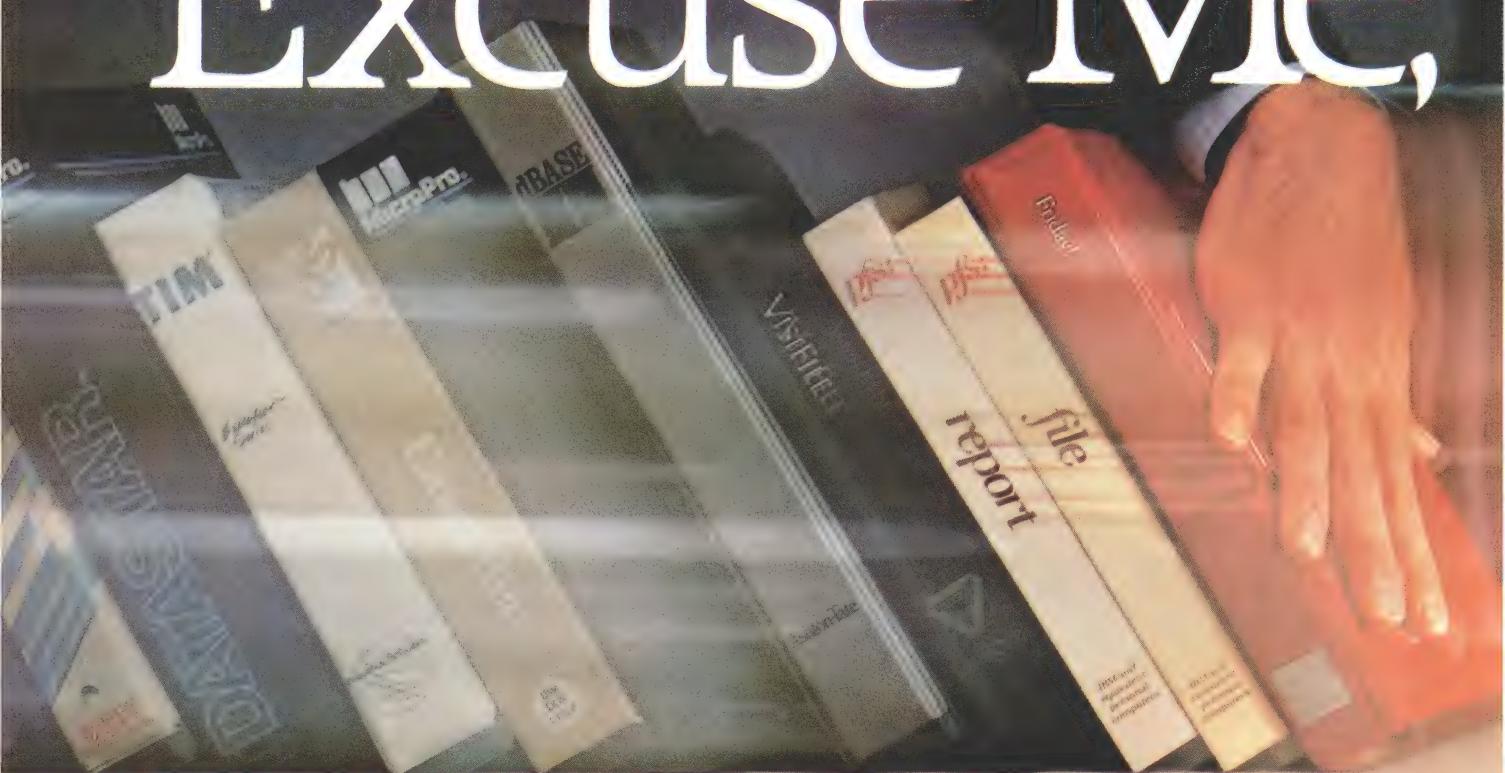
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Is?

Is the name "datascan" trademarked?

Which?

Which drugs have been successfully used to treat osteoporosis?

What?

What is the current and projected market for frozen orange juice?

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How?

How can I find all the orthodontists in Toledo for my direct mail campaign?

What?

What are the mechanical properties of shape memory materials?

Has?

Has the cost-effectiveness of teleconferencing changed in the last year?

Who?

Who are some of the experts in medical sonar scanning techniques?

all these questions by 9 a.m.?

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- Printer Diagnostics
- Clock-Calendar Diagnostics

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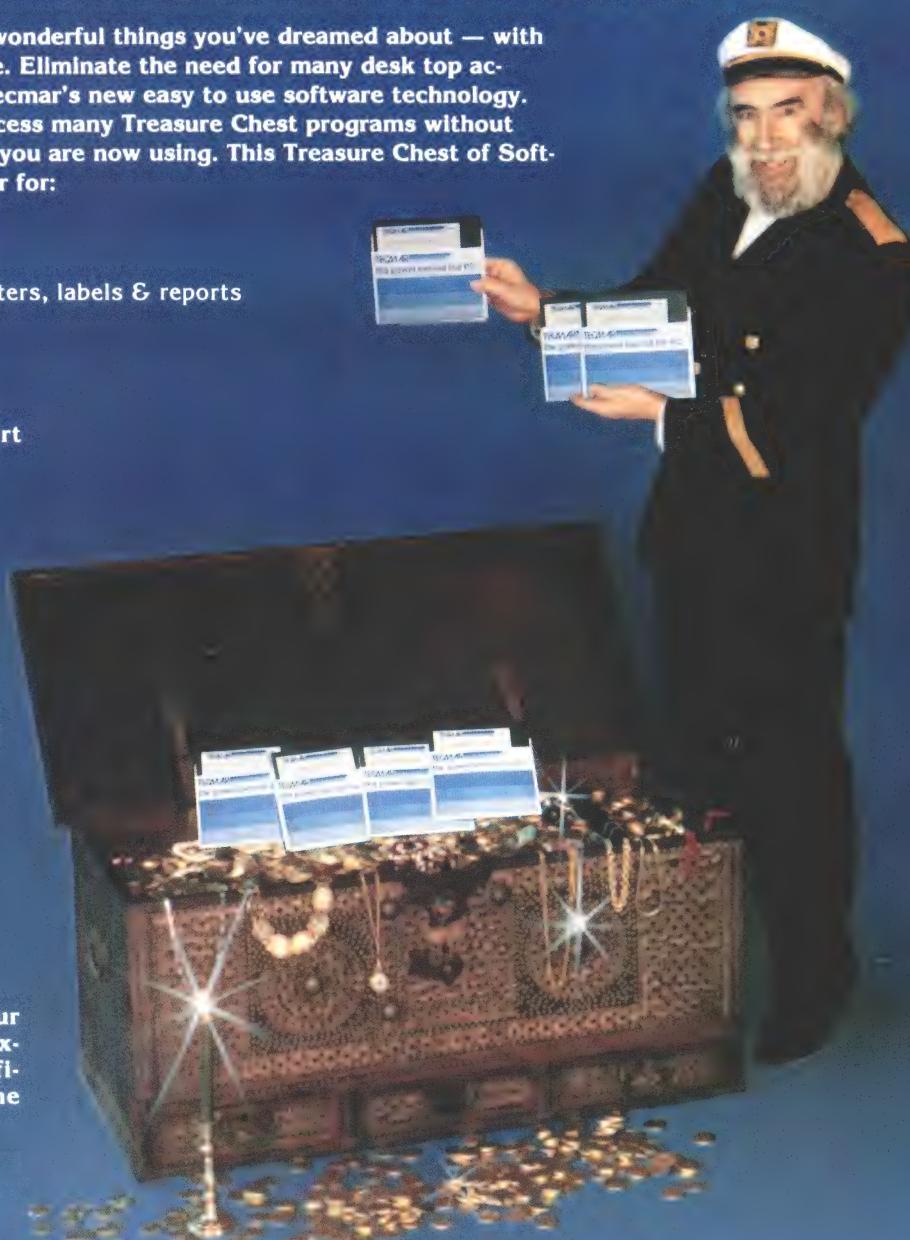
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August 1984

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PC + Video: Working Partners

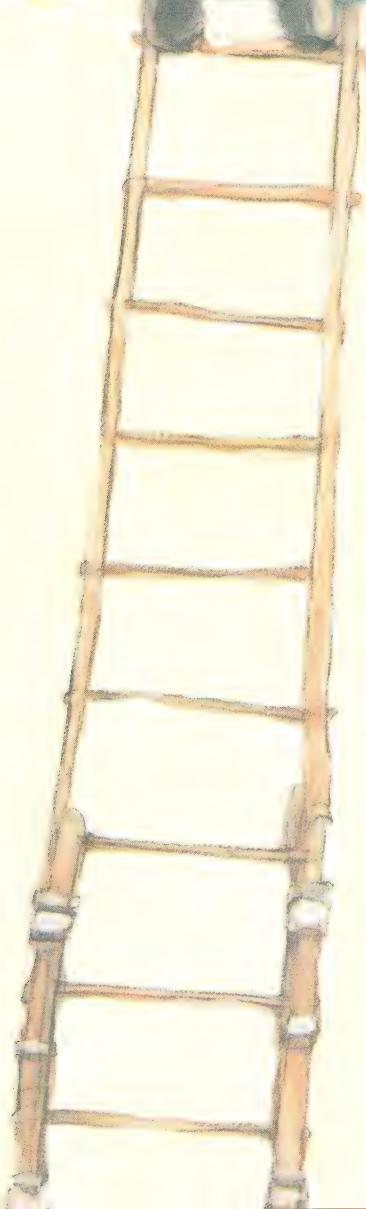
Katie Seger

You drop your 50 cents into the arcade machine and are propelled into the medieval world of Dirk the Darling, a fearless knight who leaps over bottomless pits and fights menacing dragons in a dangerous castle.

You direct the dashing knight with the machine's joystick, telling Dirk to run to the left instead of the right, to open certain doors, and to swing his sword at precisely the right moment to destroy his foe. If you make the correct decisions, Dirk wends his way through the 38 rooms of the Dragon's Lair castle and rescues a fair damsel in distress. If you make the wrong move, Dirk turns into a skeleton that disintegrates before your eyes, and you're out four bits.

You've just experienced an interactive video game. Unlike most computer games, *Dragon's Lair* has a variety of possible scenarios based on the decisions you make.

Now picture yourself in front of a PCjr. Instead of searching for maidens and decapitating dragons, you are ready to slay subjunctive verbs. Five menu options await you on the screen. You choose the third, 'Intermediate French Lesson'. The menu disappears, and the screen shows a video segment of two Parisians discussing the groceries they have bought for their Sunday dinner.



At the end of the conversation the program asks you a question. Depending on your answer, the program either continues with another question, repeats the conversation (perhaps at a slower speed so that you can practice your pronunciation), or sends you to the program's built-in dictionary to look up a word you don't understand.

Sound farfetched? It's not. The combination of computers and video that made *Dragon's Lair* an arcade hit in 1983 is nothing new. Organizations such as Xerox, Bechtel, the United States Navy, and Stanford University have been using computer-video instruction programs since the late 1970s. These programs, which combine the power of the personal computer with the pictures and sounds of a videotape or a videodisc, are only now making their way into small businesses, grammar schools and high schools, and homes.

At present the audience for computer-video educational programs consists mostly of Fortune 500 companies, colleges, and universities—the organizations that can easily afford them. Not only is the equipment to run the programs expensive, but a professionally produced, interactive computer-video program costs anywhere from \$300 to \$2000 a minute to make. These programs are usually specialized and have little appeal to home or small-business computer users.

Where the PCjr fits into this is not yet clear. However, considering the PC's increasing role in industrial video education, there's no doubt that as the PC goes, so goes PCjr. A number of firms are beginning to market interactive computer-video packages that have wide appeal, such as programs that teach elementary biology and beginning *WordStar* and *VisiCalc*. These tutorial programs are aimed at the traditional video market of schools but may also attract small-business and home users.

Linking Computers and Video

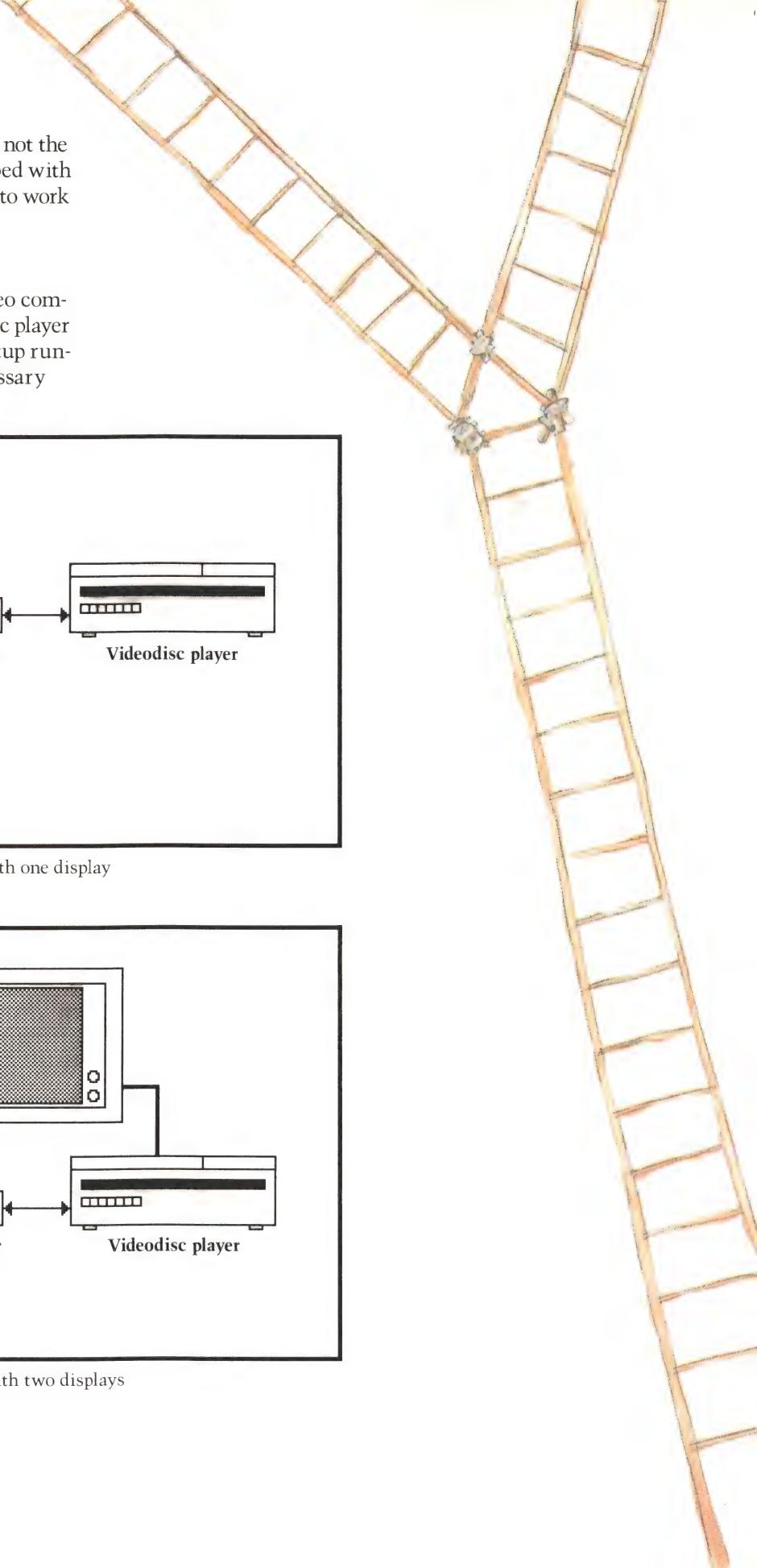
For a sophisticated interactive training program to be effective, the computer and its software must be able to command a videotape or videodisc player to perform tasks such as finding a certain part of a video program, replaying a segment, advancing to another

A professionally produced, interactive computer-video program costs anywhere from \$300 to \$2000 a minute to make.

segment, and freezing a frame in the program. Likewise, the player must be able to understand and follow the computer's commands. Home video players are still severely limited in their ability to work with computers, so industrial machines, such as the Sony 5800 videotape player and the Pioneer LD-V1000 videodisc player, are used for interactive training programs.

Most personal computers were not designed with video in mind, so you have to connect the computer to the player with special hardware. Several companies, such as Allen Communication, Cavri, and Whitney Educational Services, produce controller boards for IBM and Apple computers that link them to video machines. The PCjr, because of its small system unit, cannot use the internal controller boards currently available for the PC.

However, the PCjr can work with many stand-alone controller boxes such as Allen Communication's Universal Video Controller (UVC). These controllers use any computer's standard serial port to connect to a variety of industrial videotape and videodisc players now on the market. Some models, including the UVC, enable computers to control two videotape players, two videodisc players, or a videotape and a videodisc player. The cost of such models—up to \$1000—may be a little steep for PCjr owners.



Keep in mind that the PCjr's serial port is not the standard 25-pin connector and must be equipped with the IBM PCjr Adapter Cable for Serial Devices to work with a stand-alone controller.

One Screen or Two

Figures 1 and 2 illustrate typical computer-video combinations. Figure 1 shows a PCjr and a videodisc player running one display; Figure 2 has the same setup running two displays. Two displays are often necessary

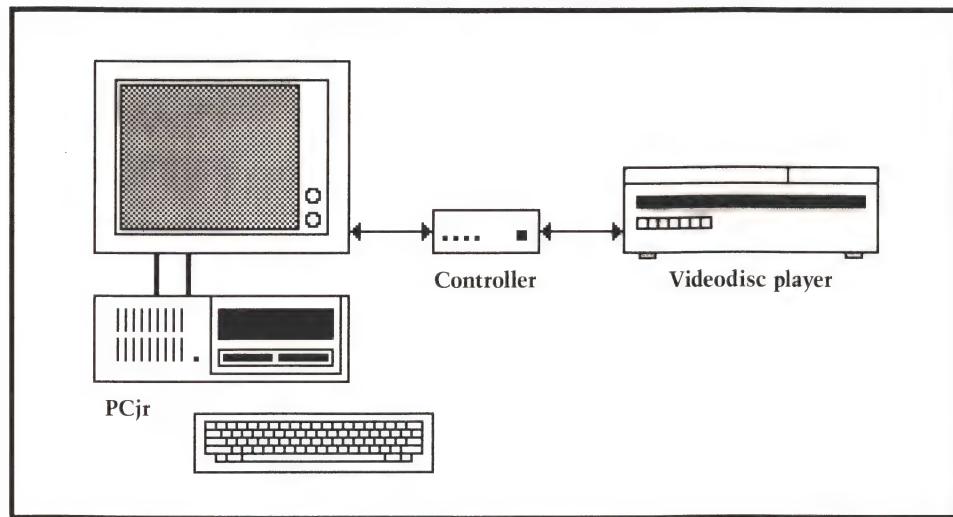


Figure 1: A PCjr and a videodisc player combined with one display

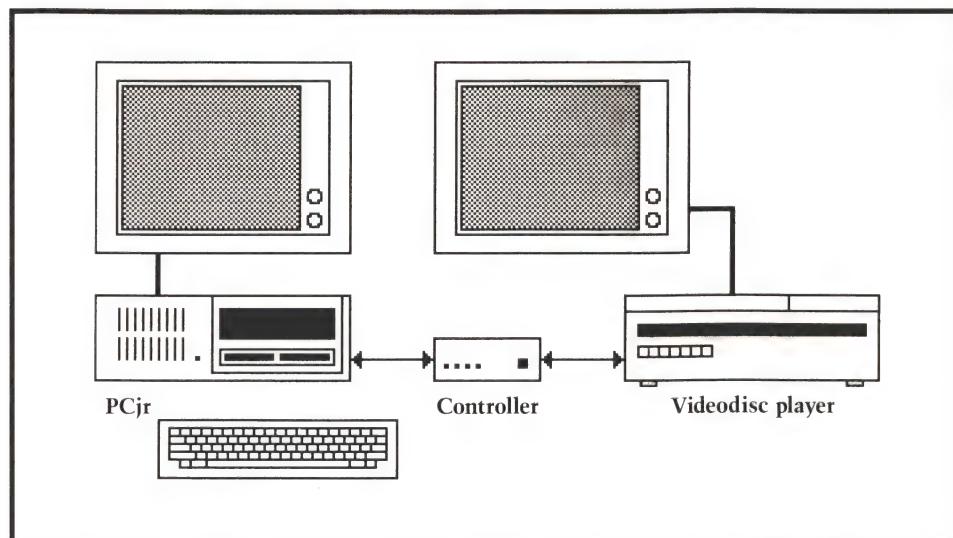


Figure 2: A PCjr and a videodisc player combined with two displays



Video

since merging, or overlaying, video images and computer text or graphics on one screen is difficult. Monitors that permit merging, such as the 12-inch Sony Profeel, are twice as expensive as standard color monitors.

The type of program you are running and the quality of the display dictate which configuration is right for you. If the program is designed to switch between computer text and video segments, you can run it on one display—your TV set, for example. Programs that need two displays running at once or require extensive typing, such as a word processing or spreadsheet tutorial, demand the sort of configuration shown in Figure 2, including, for instance, a TV set and a standard computer monitor.

Software and Video

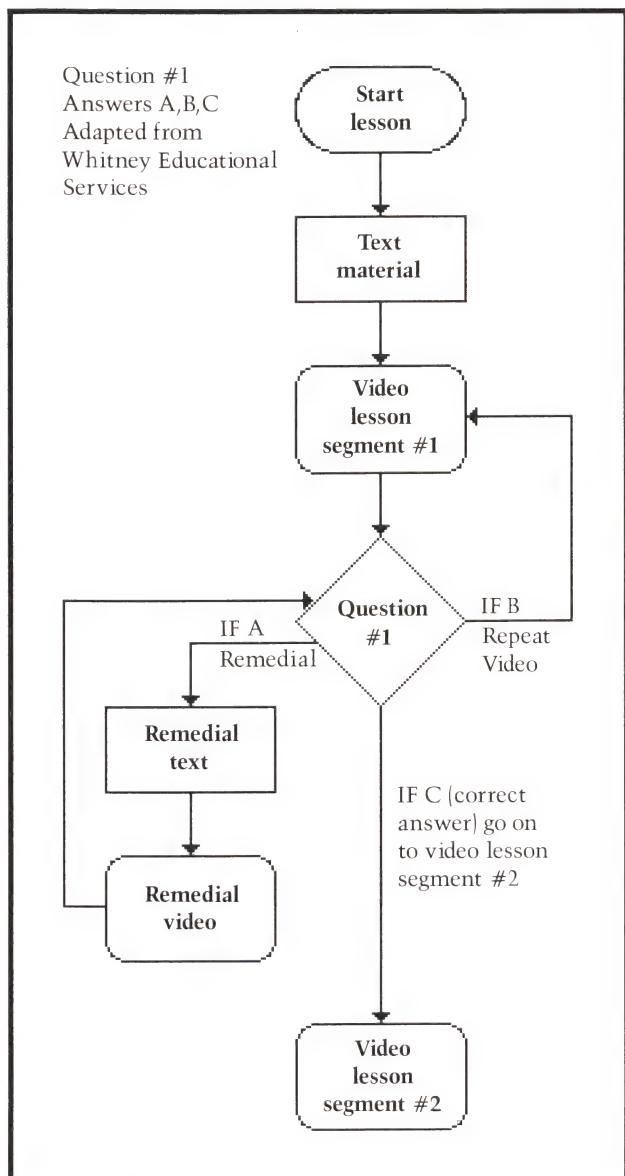
An interactive training program will be viewed by more than one individual, so a program designer must anticipate how different people will react to the program. Some students grasp concepts and ideas the first time; others need repetition before they clearly understand information. A third group of students may need the information explained in a different way before it makes sense to them, or they may want reinforcement from books or articles that a program refers to. Ideally, all of these people can use the same interactive program.

An astute program designer realizes that there are many paths to the correct answer. Students at different levels can learn the same concepts at their own speeds. An interactive computer-video French program, for example, might ask a student the meaning of the word *poulet*. The program advances to the next question if the student types the correct answer, repeats the video segment of the Parisians discussing their dinner if the response is slightly incorrect, or shows a picture of a chicken and repeats the word *poulet* if the student types a wildly incorrect response. Each one of these possible paths is called a "branch"; any well-planned interactive program will use branching as much as possible to increase its usefulness—and its profitability.

At its simplest you can think of a program branch as a fork in a stream: you are carried one way or the other depending on your action. A more effective program, of course, allows for more than two responses to a question. Instead of merely repeating previous material, the program may present the same informa-

tion differently (see Figure 3). The more interactive a program, the more sophisticated; well-designed interactive programs seem more human than mechanical. Some branches have their own branches that explore certain information or concepts in greater detail before returning to the main theme of the program.

The best interactive educational programs are plotted out with storyboards and scripted like Hollywood films. Besides structuring lessons and anticipating problems students might have with the material, program designers must be aware of and work around the mechanical restrictions of interactive devices.



In interactive video programs, video segments are not necessarily played in sequence; some segments are repeated more often than others. An annoying problem of *Dragon's Lair* is the blackout that occurs when the videodisc switches from segment to segment in response to a twist of the joystick. What do students do while a videotape is rewinding or a videodisc player is searching for a specific frame? Instead of displaying a blank screen, carefully designed programs mask this dead time by switching to computer-generated graphics or text while the videotape or videodisc player finds the appropriate video segment. Programs might also refer students to written material in workbooks or textbooks at these times. As videodisc players, which have faster access times than videotape players, get faster and cheaper, these delays may be minimized.

Author, Author

Although the majority of educational computer-video programs are made from scratch with specially filmed video segments, some are made with preexisting video material. A high school with a large videotape library

A teacher can use the episode on the Civil War from Alistair Cooke's television series "America" to create an interactive lesson for a freshman American history class.

need not ignore this capital investment. Instead, the videotapes can be incorporated into interactive programs by means of an authoring system run on a computer. An authoring system is sophisticated software that lets nonprogrammers create interactive computer-video programs, usually with easily edited videotape.

For example, a high school may have all 13 episodes of Alistair Cooke's television series "America" in its videotape library. With an authoring system a teacher can use the episode on the Civil War to create an interactive lesson for a freshman American History class. The teacher can design the program to

Figure 3: Flow chart of interactive branching

match a course's lesson plan and to direct students to other available material. For instance, a question about battle strategies at Gettysburg could refer students to specific pages in the class's textbook or to a biography of Ulysses S. Grant that is in the high school library.

While the video segment itself cannot be changed, the interactive programs generated by authoring systems can be changed and updated with little trouble. Adding questions or branches to the program gets easier as the teacher becomes more familiar with an authoring system.

Washington Computer Services's *PC/PILOT* is one authoring system that runs on the PCjr. Authoring systems designed for the PC that require 128K or less memory, such as Whitney Educational Services's

Well-designed interactive programs seem more human than mechanical.

Insight-PC, will probably run on the PCjr. To date, manufacturers have not completed testing of PC authoring systems on the PCjr.

The Future

Dragon's Lair and similar games have brought interactive programs out of corporate offices and into arcades. The growing list of tutorials will bring more interactive programs into small businesses and the traditional school video market. The next step—bringing interactive programs into the home—will take a while, but some recent developments suggest that the wait will be short.

Videotape and videodisc players are becoming more sophisticated and cheaper. An estimated 10 million homes in the United States have videotape players, and that number should grow to 40 million by 1990. Many of these homes do or will contain computers, so the home audience is growing.

Coleco paid an estimated \$2 million for the worldwide licensing rights for *Dragon's Lair* and expects to release a floppy disk version of the game for its Adam computer this summer. A Coleco spokesperson

says, "We expect Adam to have interactive videodisc playing capability sometime in 1984."

Industry rumor also has it that IBM is working on a videodisc project. The rumor is strong enough that some interactive producers are waiting to see what Big Blue has up its sleeve before they start production on interactive programs.

So Dirk, our knight in shining armor, is leading the way. But it will be interesting to see who and what follows our interactive hero.

Katie Seger is an Assistant Editor for PC World.

Universal Video Controller

Allen Communication

140 Lakeside Plaza II

5225 Wiley Post Way

Salt Lake City, UT 84116

801/537-7800

List price: \$995

PC/PILOT

Washington Computer Services

3028 Silvern Ln.

Bellingham, WA 98226

206/734-8248

List price: with single-user license \$100, with multiuser license \$550

Requirements: 64K, one disk drive

Insight-PC

Whitney Educational Services

1777 Borel Pl. #416

San Mateo, CA 94402

415/341-5818, 415/570-7917

List price: \$990

Requirements: 128K, one disk drive (two recommended)

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*How to program three-voice music
on the PCjr*

Three-Part Harmony

Warren Sirota

The designers of the PCjr endowed their creation with fine musical capabilities. The PCjr contains a "three-voice synthesizer," which enables the computer to play three notes simultaneously, permitting chords and harmonies in musical programs. Of course, the PCjr does not match the rich tones of music synthesizers that professional musicians play, but those synthesizers don't play video games or run applications programs. While the PCjr is not a Stradivarius, it can provide musical entertainment and education.

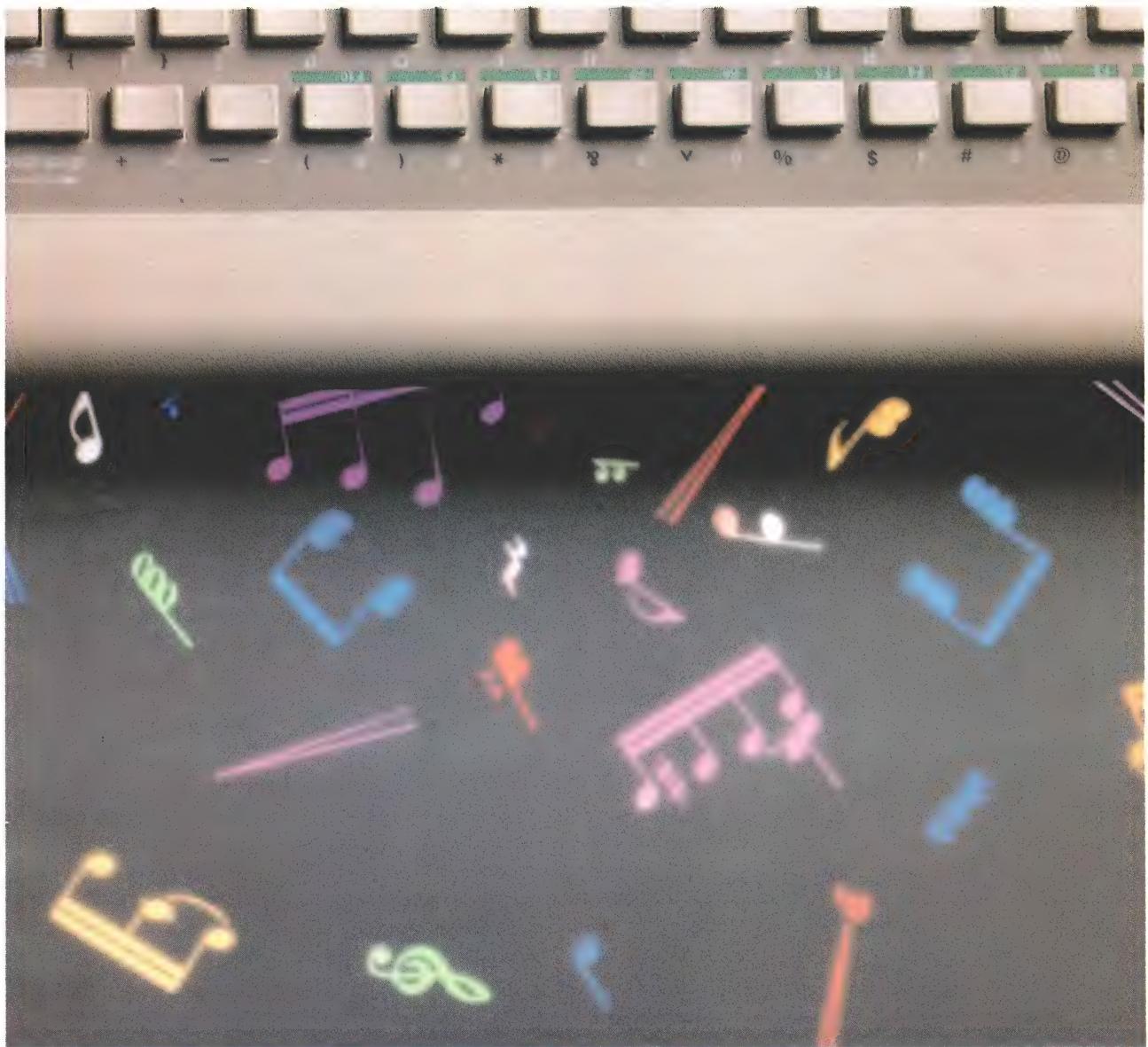
The PLAY statement (see "PCjr Strikes a Chord," *PCW*, Vol. 2, No. 7) is the easiest way to unlock the PCjr's musical talents. The PLAY statement's many options make it a powerful programming instruction. On the PCjr the PLAY statement is only available in Cartridge BASIC, which you must have before you start this music lesson.

A Noteworthy Start

Plug in Cartridge BASIC and turn on the PCjr. The computer loads BASIC and displays copyright and memory information and an 'Ok' on the screen. Type **PLAY "CDE"** and press <Enter>. The PCjr plays the three notes C, D, and E.

You can command the PCjr to play notes A through G in seven octaves. You indicate sharps with either a pound sign or a plus sign. The note F-sharp, for example, is written as either **F#** or **F+**. Flats are indicated by a minus sign, so the note B-flat is written **B-**.

Notes are grouped into octaves; each PCjr octave begins at C and continues up the scale to the note B. The computer has a range of seven octaves; octave 0 (zero) is the lowest octave, and octave 6 is the highest. The PCjr assumes that notes are in the default octave, octave 4, unless you specify another octave. To play notes in octave 5 instead of octave 4, for example, you type **PLAY "05 CDE"**. (Type the letter **O**, for octave, not the number zero.)



You can also specify the octave with programming shorthand. The "greater than" symbol raises the octave, and the "less than" symbol lowers the octave. For example, if you type PLAY "CD<E", the last note is much lower than the first two notes, because the E is played in a lower octave than the C and the D.

A BASIC Record Player

Now that you have an idea of the PCjr's range with its internal speaker, you should hook up the computer to a stereo system to take full advantage of the PCjr's three-voice capabilities. (See "Hook Up PCjr to Your Stereo System" in "PCjr Strikes a Chord," *PCW*, Vol. 2, No. 7.) If your television set serves as the PCjr monitor, the TV speaker provides the three-part voice.

Listing 1 is a three-voice composition for the PCjr. The program can be thought of as both record player and record. Statements 10 through 110 constitute the "record player"; they tell the computer to read and play music specified in the DATA statements that follow them. The remainder of the program—in this case DATA statements 1000 to 1120—constitutes the "record"; it translates the tune into instructions that the PLAY statement can understand. When you want to play a different tune, change the DATA statements but leave statements 10 through 110 intact.

Look at the record player part of the program. Line 10, 'SOUND ON', shuts off the PCjr's internal speaker and directs further audio signals out through an external speaker. Be sure that the volume control of the TV or the stereo is

```

9  '* Turn on the external speaker
10 SOUND ON
19 '* Set the tempo in all three voices
20 READ TEMPO$
30 PLAY TEMPO$, TEMPO$, TEMPO$
39 '* Read number of measures & rounds
40 READ MEASURES, REPEATS
50 FOR COUNT=1 TO REPEATS
60   FOR MEASURE=1 TO MEASURES
69     '* Read a measure
70     READ A$, B$, C$
79     '* Play the measure
80     PLAY A$, B$, C$
90   NEXT MEASURE
99   '* Set data pointer to start of 1st measure
100 RESTORE 1010
110 NEXT COUNT
1000 DATA "T150", 12, 2
1010 DATA "O3 D1", "O4 D4.C#8 L4DE", "P1"
1020 DATA "D2 D2", "F D2 F", "P4O3A2>D4"
1030 DATA "L4 >C<AB-A8G8", "L2 ED", "P1"
1040 DATA "A2 D2", "C#P4 F4", "P2.D4"
1050 DATA ">C<AB- G", "ED", "P1"
1060 DATA "E2.E", "E4.E8<A4>E4", "C#4.C#8P4C#4"
1070 DATA "L2 DD", "L8 DC#DE L4 DE", "P1"
1080 DATA "DD", "F D2 F", "P4<A2>D4"
1090 DATA "L4 >C<AB-G", "E2D2", "P1"
1100 DATA "A2.A", "C#4.D8 L4 ED", "P1"
1110 DATA "L4 AF#GA", "C#DDC#", "P1"
1120 DATA "D2.D", "F#4.F#8<A>F#", "D4.D8P4D4"

```

Listing 1: Branle Simple program

turned up so that you can hear the computer music. Lines 20 and 30 set the tempo—the number of beats per minute. Line 30 contains three TEMPO commands because BASIC requires that you tell each voice what tempo to play. This BASIC programming quirk allows avant-garde experimenters to write interesting musical compositions by setting each of the computer's three voices at a different tempo. However, for conventional western music you should set all the tempos at the same number. The PCjr can vary the tempo from 32 to 255 beats per minute. Since the PCjr can play up to 16 notes per beat, the computer can play as fast as 68 notes per sec-

ond in all three voices—a musical feat that even Eric Clapton might envy. The next 12 lines of the program instruct the PCjr to read and play each measure and to repeat the entire piece as many times as the DATA statements instruct.

I Hear a Melody

Now it's time to get down to transcribing music. Let's start with a funky little number from the sixteenth century called "Branle Simple" (the Branle was a type of dance popular during the period). The piece was written for the guitar by French composer Adrian

Branle Simple Adrian Le Roy, 1551



Figure 1: A sixteenth-century dance

Le Roy. It is appropriate for the PCjr, for as Figure 1 shows, no more than three notes are played at any one time (notes that are played simultaneously are printed one above the other on the staff). If you don't know anything about reading music, read "How to Read Music—A Crash Course" before proceeding.

The Branle contains three voices, or lines—the melody line, the harmony line, and the bass line. The melody line has the highest notes of the three voices, while the bass line, with the lowest notes, provides the Branle's rhythmic foundation. In this piece the harmony line—the middle notes—provides occasional support for the melody and appears only in even-numbered measures. For no reason other than for convenience of presentation, I have programmed the bass line as voice 1, the melody line as voice 2, and the harmony line as voice 3. You can number the voices differently if you choose.

The first DATA statement of the program must contain the tempo of the piece, the number of measures in the tune, and the number of times the piece is repeated; the information must be written in that order. The tempo is written as `Tn` where `T` signifies tempo and `n`

The program can be thought of as both record player and record.

is a variable that stands for the number of beats per minute; how many measures and repetitions the piece has is designated by numbers. A good tempo for this piece is 150 beats per minute. The piece has 12 measures, and we want to play the whole piece twice. Hence, our first DATA statement is '`1000 DATA "T150", 12, 2'`.

The other DATA statements each contain one measure's worth of notes for each voice in the form of three character strings separated by commas. The first string

in each statement represents the notes that are played by the first voice, the second string represents the second voice, and the third string represents the third voice. You should number the DATA statements so that measure 1 appears in statement 1010, measure 2 in statement 1020, measure 3 in statement 1030, and so on. This numbering makes it easier for you to keep track of the measures while transcribing a piece of music and helps you correct mistakes you make when typing in the program. If you use different line numbers, you must change the RESTORE reference (in line 100) to the line number of the DATA statement containing the first measure.

Coding the first measure requires virtually all of the PLAY statement instructions, so it serves as a good musical transcription example. Don't be intimidated by the PLAY statement details. I translated my sheet music into the DATA statements in less than an hour, and this was the first piece I transcribed for the PCjr; it would have taken me nearly as long to copy the piece by hand.

To play a note on the PCjr you need to tell the computer three things: the note's octave, its name, and its length. Look at the first measure of Figure 1. The first note for the bass voice is a whole note, D. In program statement 1010, "“03 D1”" tells the PCjr that the note is in octave 3, is a D, and plays for the entire measure.

You specify note length by following the name of each note (in this case D) with a number from 1 to 64. The Branle is written in 4/4 time, so if the length of the note is a number, n , then the note will be played for $4/n$ beats. The number 1 indicates a whole note, the number 2 a half note, the number 4 a quarter note, and so on. The number 3 may also be used, although strictly speaking a "third note" doesn't exist. If you specify "D3", the note D plays for a third of a measure (for the musicians among you, that is one note of a triplet of half notes).

Look at the second string in statement 1010, "“O4 D4.C#8 L4DE”". This string describes the melody line (voice 2) of the first measure; it is more complicated than the bass voice string because it has to describe four notes instead of only one. The first note of the melody voice is D in octave 4, and it lasts for one and a half beats. It is a "dotted quarter note"; you indicate its length with a 4, as with all quarter notes, followed by a dot, or a period. Musicians should appreciate the naturalness of this programming notation since it mirrors musical notation. When you write the second note of the melody line, you don't have to specify the octave. The PCjr continues to play in the octave chosen

How to Read Music—A Crash Course

Beethoven and Mozart would probably chide anyone who tried to explain music notation in this short a space. However, this crash course should be enough to get you started with musical programming.

The Staff

A music staff is a set of five parallel lines on which music is written. Figure A shows a staff with the names and positions of notes. The symbol at the beginning is called the treble clef, or the G clef. Its curlicues always center around the second line from the bottom of the staff and indicate that this line represents the note G. If you read from left to right, the notes go up the scale—that is, each note is higher than the one preceding it. Four notes—D, E, F, and G—appear on the staff twice. The repeated notes are an octave apart from their counterparts.

Measures, Lengths, and Signatures

Music is divided into units called measures, separated by vertical lines on the staff. The two numbers that appear at the beginning of a piece of

music and look like a fraction are called the time signature. The upper number tells you how many beats are in a measure, and the lower number tells you which type of note gets a single beat. In the most common time signature, 4/4, each measure has four beats, and quarter notes get one beat each. In the interest of clarity this article refers only to 4/4 time (see Table A).

A dot following a note means that you increase its length 50 percent. For example, since half notes normally receive two beats, dotted half notes receive three beats. Similarly, dotted quarter notes get one and a half beats.

The key signature tells what key the music is written in; it is shown by sharps and flats at the beginning of each line. In "Branle Simple," for instance, a flat (b) is marked on the B line of the staff. This means that you play every B as B-flat. This musical rule can be overridden within a piece by placing a natural sign (n) in front of any note that should not be sharpened or flattened.

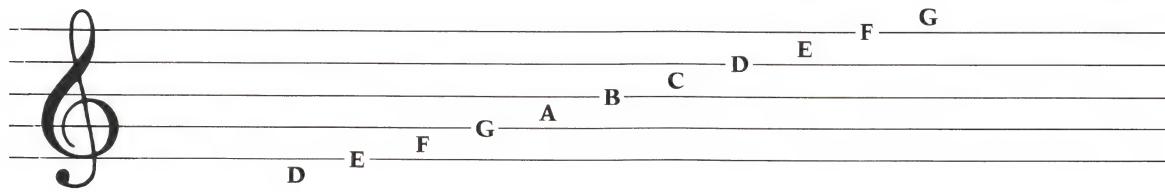


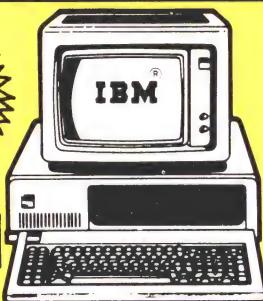
Figure A: The notes on the treble clef

Note	Note Name	Number of Beats
●	Whole note	4
♩ or ♪	Dotted half note	3
♪ or ♩	Half note	2
♪ or ♩	Dotted quarter note	1½
♩ or ♩	Quarter note	1
♪ or ♩ or ♪	Eighth note(s)	½
♪ or ♩ or ♪	Sixteenth note(s)	¼
♪ or ♩ or ♪	Thirty-second note(s)	⅛
♪ or ♩ or ♪	Sixty-fourth note(s)	⅛

Table A: The shapes of notes, their names, and their durations under 4/4 time

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Programming

for the previous note until the octave is changed. (This rule is true for all three voices, but each voice needs an initial octave setting.) So the second note, a C-sharp eighth note, is written 'C#8'.

The final two notes in the first measure are both quarter notes. Instead of specifying their lengths individually, you can again use the PLAY statement's shorthand. 'L4' sets the default note length in this voice as a quarter note. You can change the default setting by issu-

The programming notation mirrors musical notation.

ing another L command, such as L2, which sets the default note length as a half note. The remainder of the second string, 'DE', tells the PCjr the names of two notes. Since no length is specified, the notes will last for one beat each.

In addition to telling the PCjr when to play you must be able to tell the computer when not to play. As mentioned earlier the third voice in this piece has few notes. However, these notes must play at the right times, or the music would resemble a lesser-known Charles Ives piece. In order to prevent such unplanned dissonance, you must tell the third voice to pause for a specified number of beats when it has no music to play. This programming is just like telling the computer to play a note for a certain number of beats except that you use the letter P, for pause, instead of a note name. The third string in the first measure,

"'P1'", tells the third voice to be silent for the length of a whole note, or one measure.

It is easier to transcribe music in 4/4 time than in some other time signatures because the PLAY statement always assumes that quarter notes get a single beat. However, you can overcome this programming limitation. When you transcribe a musical piece written in another time signature, you still put one measure's worth of information into each DATA statement; in 3/8 time, for example, you put three beats in each measure. In 3/8 time, eighth notes, rather than quarter notes, receive a single beat, but when you transcribe the piece as written, the PCjr plays the music twice as fast as it should be played. To slow the music down, you halve the tempo of the piece. The PCjr will still play each eighth note for a half beat, but the new tempo setting will make the eighth notes as long as a full beat at the original tempo.

Now that you have the foundation for three-voice programming, you should be able to understand the program's DATA statements as well as write data statements for other musical pieces. Type in the program and let the PCjr transport you back to the sixteenth century. And if the Branle is too sedate, you can always program a break dancing tune.

Warren Sirota is a member of the consulting firm Midway Software, of Berkeley, California. He is also a member of the Electric Guitar Quartet, a classical music group.

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Enhancing your PCjr is as easy as finding the right slots.

Plug In More Power

Katie Seger

A common trait among computer owners is the desire for more—more memory, more options, more power. Whether you start off with the entry or the enhanced PCjr model, you will probably want to upgrade your system by adding one or more expansion boards. Unlike the PC, which requires that you reset switches on the motherboard (the main system circuit

board into which other boards can be inserted) when you install certain expansion boards in the system unit, the PCjr's circuitry is designed to accept additional boards without special modification. So adding a disk drive and its controller board, an internal modem, and a memory and display expansion board can be a relatively simple, do-it-yourself task. If you're not confident of your ability to perform such a task safely, you can have the options installed by a dealer or a qualified technician. This article takes you step-by-step through installing these options. The only tool you need is a flathead screwdriver.

1



Figure 1. Turn your PCjr off. Disconnect the power supply cord and transformer, the monitor and attachment cable, and any other cables or cords attached to the system unit. Place the system unit on a flat work surface and turn it so the back panel is facing you. Gently pry open the system unit cover with the screwdriver. The PCjr has three notches on the back panel for this purpose.

Figure 2. Remove the internal power supply board by gently pulling up both ends of the board.

Figure 3. Push out the removable plastic faceplate above the ROM cartridge slots. This opening is for the half-height disk drive.

2



3



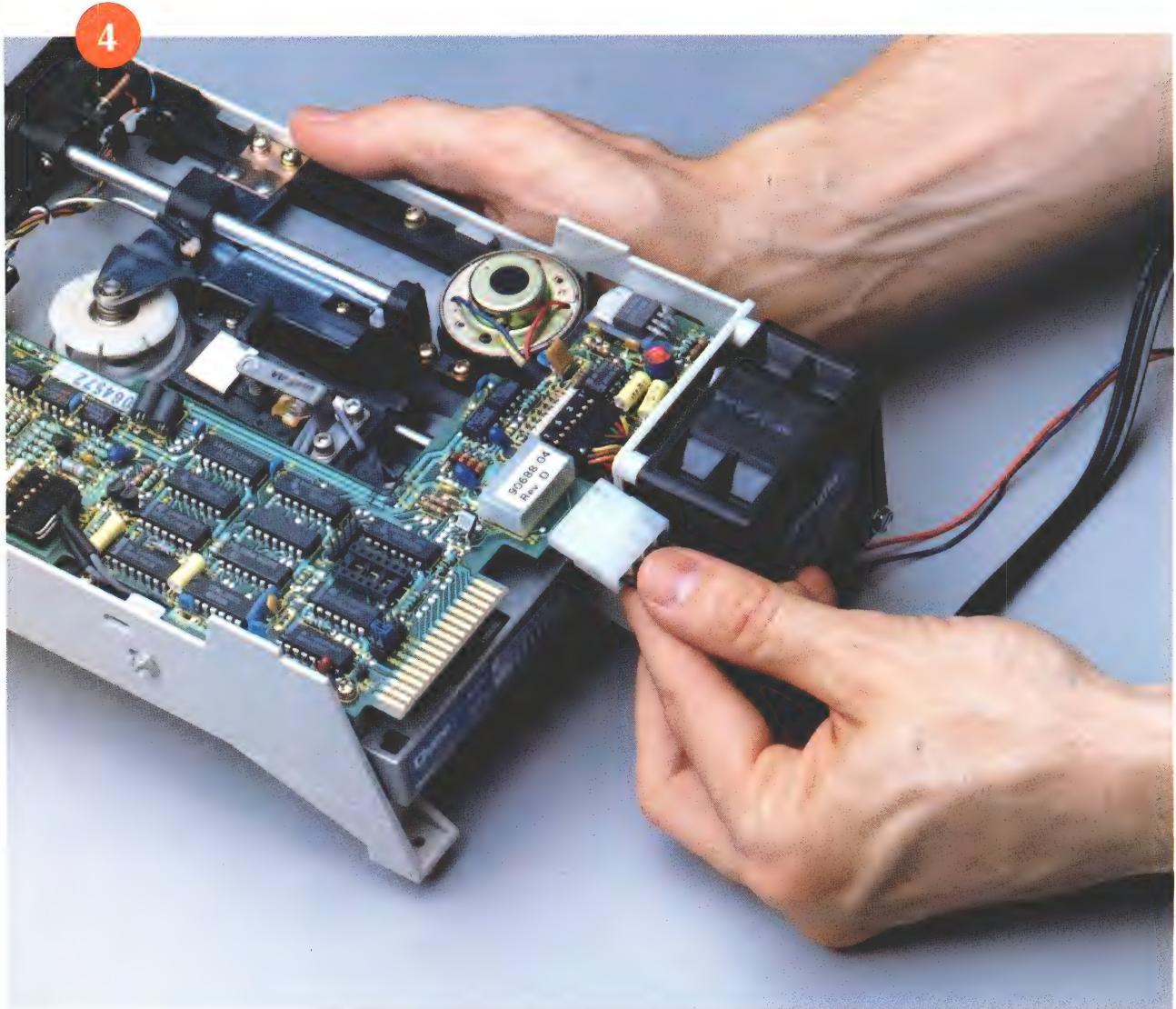
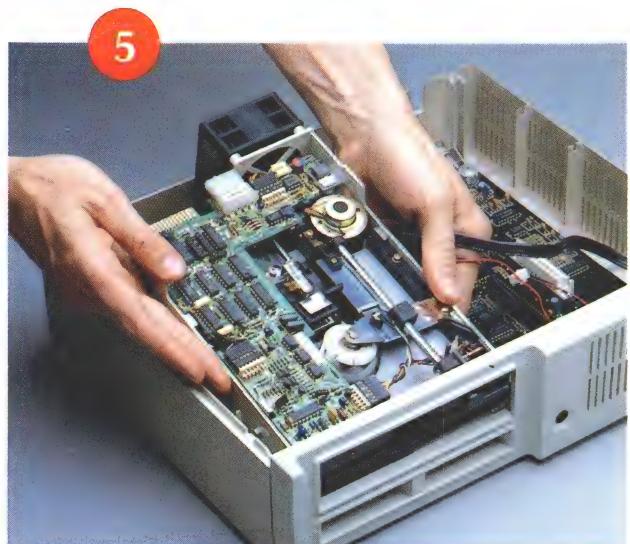


Figure 4. Plug the black disk drive power cable into the four-prong connector on the disk drive. The connector is next to the disk drive's fan.

Figure 5. Put the power cable and the two-wire fan cord underneath the disk drive. Slide the drive over the ROM cartridge slots and into the front panel drive opening. The fit should be snug. Align the disk drive's two plastic

mounting pins with the two holes that are on the computer's motherboard. Make sure that the disk drive power cable and wires are under the drive but away from the mounting pins, then press down on the disk drive's plastic sides to secure the drive to the motherboard. The drive should snap into place.



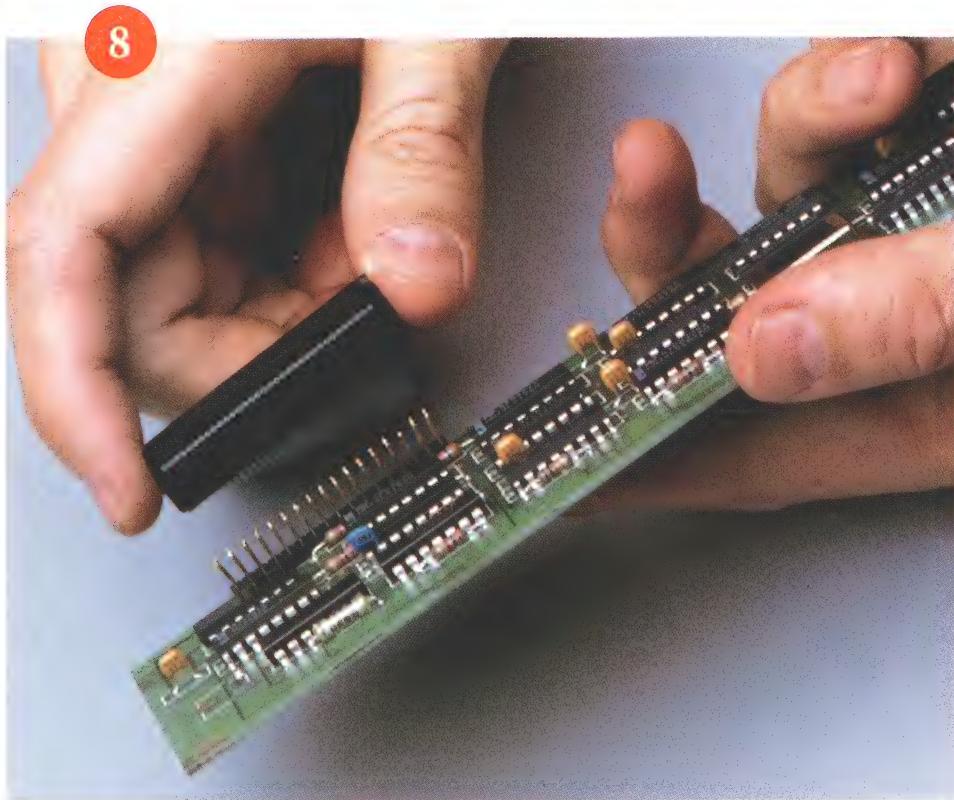
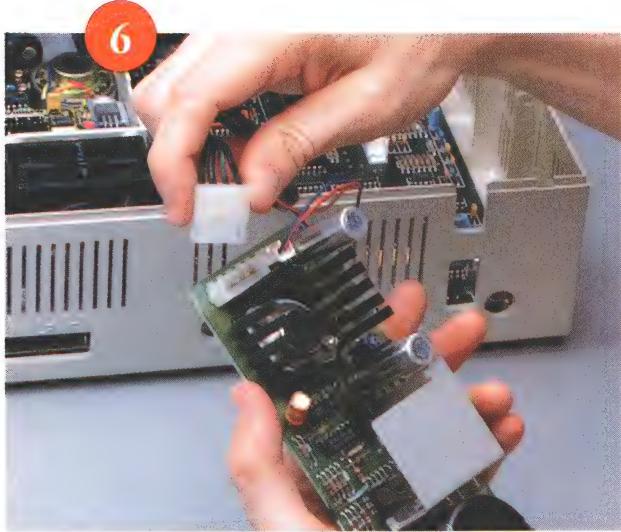


Figure 6. Plug the disk drive power cable and the two-wire fan cord into the internal power supply board.

Figure 7. Plug the internal power supply board back into its slot. Internal plastic board guides near the back of the system unit will help you position the board.

Figure 8. Plug the straight end of the disk drive signal cable into the disk drive controller board.

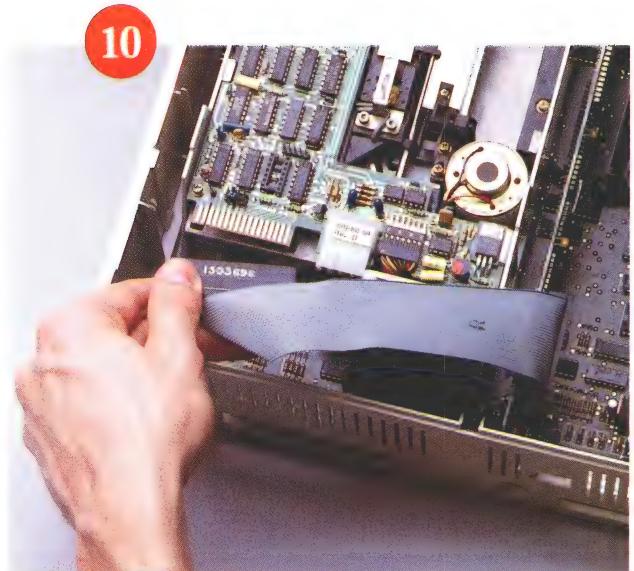
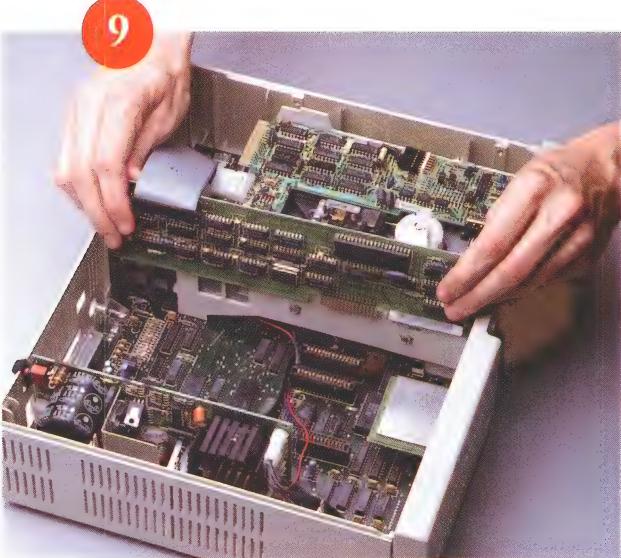


Figure 9. The PCjr has three expansion slots on its motherboard. The slot next to the disk drive is dedicated to the disk drive controller board. Plug the controller board into this slot, but be sure that the board is not crimping the disk drive power cable or fan cord. The controller board, like the two other IBM expansion boards, has notches that provide safe passage for these wires.

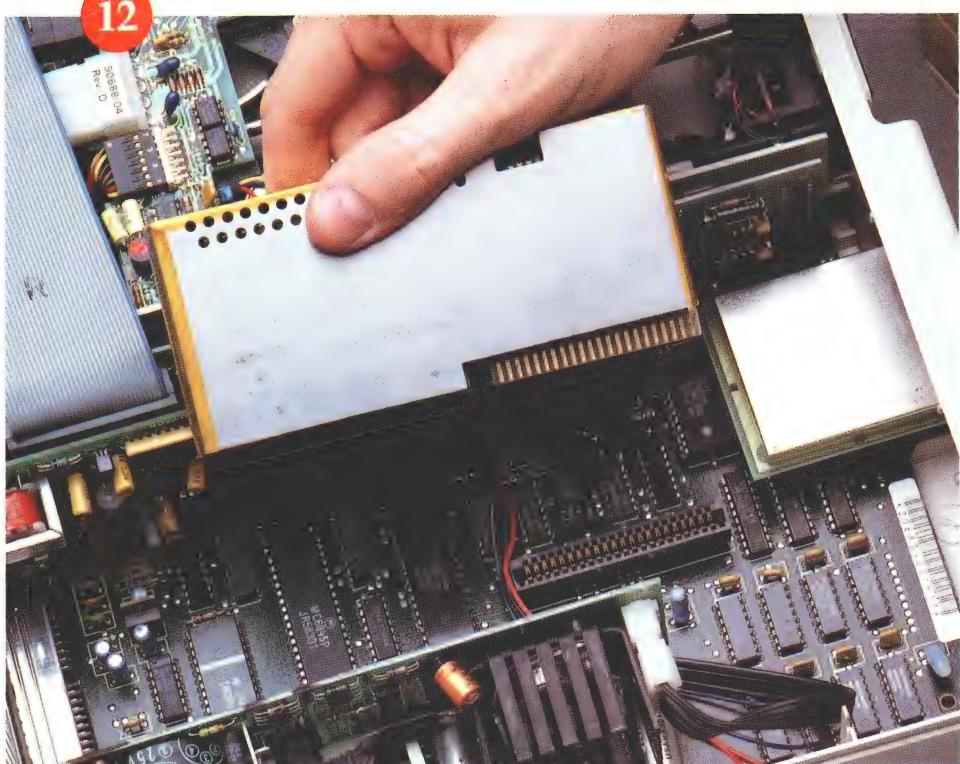
Figure 10. Attach the folded end of the gray and blue signal cable to the connector on the disk drive.

Figure 11. The slot next to the disk drive board is reserved for the internal modem. Plug the modem into the slot. The board aligns with the M (for modem) socket on the system unit's back panel.



Figure 12. The remaining slot is the longest of the three slots and is for the memory and display expansion board. This board is encased in a metal covering. Once again, be careful not to crimp the disk drive cable and wires when you plug in the board.

Figure 13. Your job is almost done. Slide the system unit cover back into place. Gently press down on the back to secure the cover to the system unit. Reattach the power transformer and monitor, turn on the PCjr, and test out your improved machine.



Your enhanced PCjr now has 128K RAM and can display 80 columns of text and graphics. The computer's new disk drive lets you run the disk-based games or applications programs that work on the PCjr. The internal modem (along with a communications program) gives you the opportunity to telecommunicate with other computer owners near and far.

Your handiwork took less than half an hour. That's a lot of computer power for only 30 minutes of effort.

Katie Seger is an Assistant Editor for PC World.

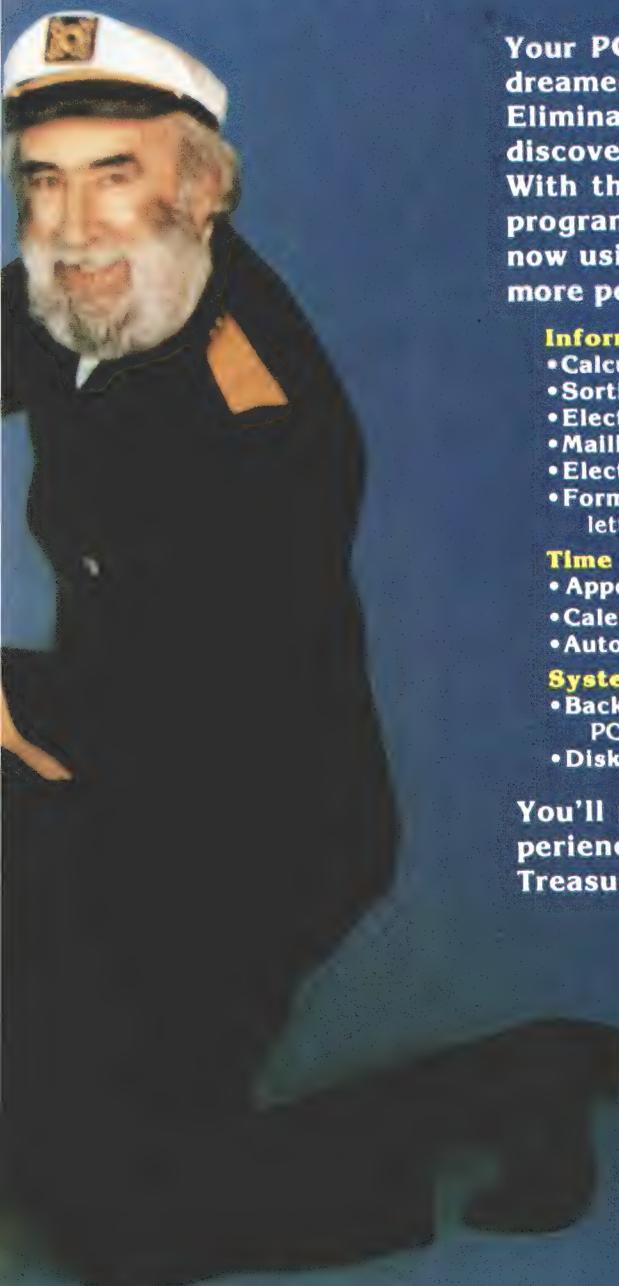
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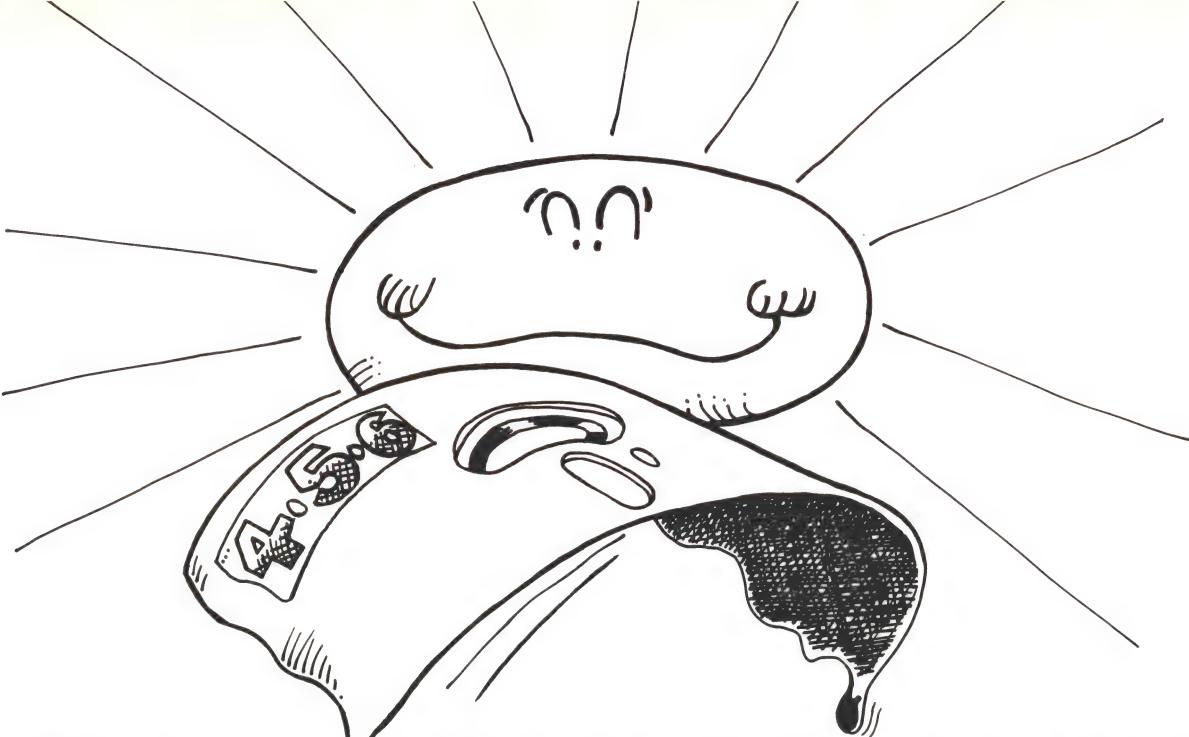
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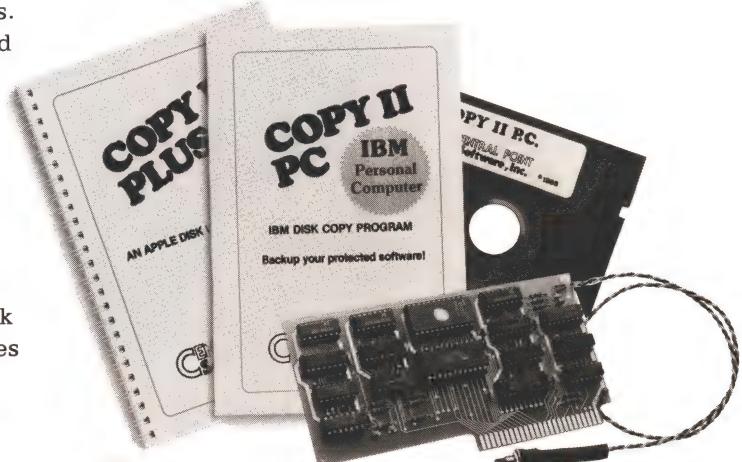
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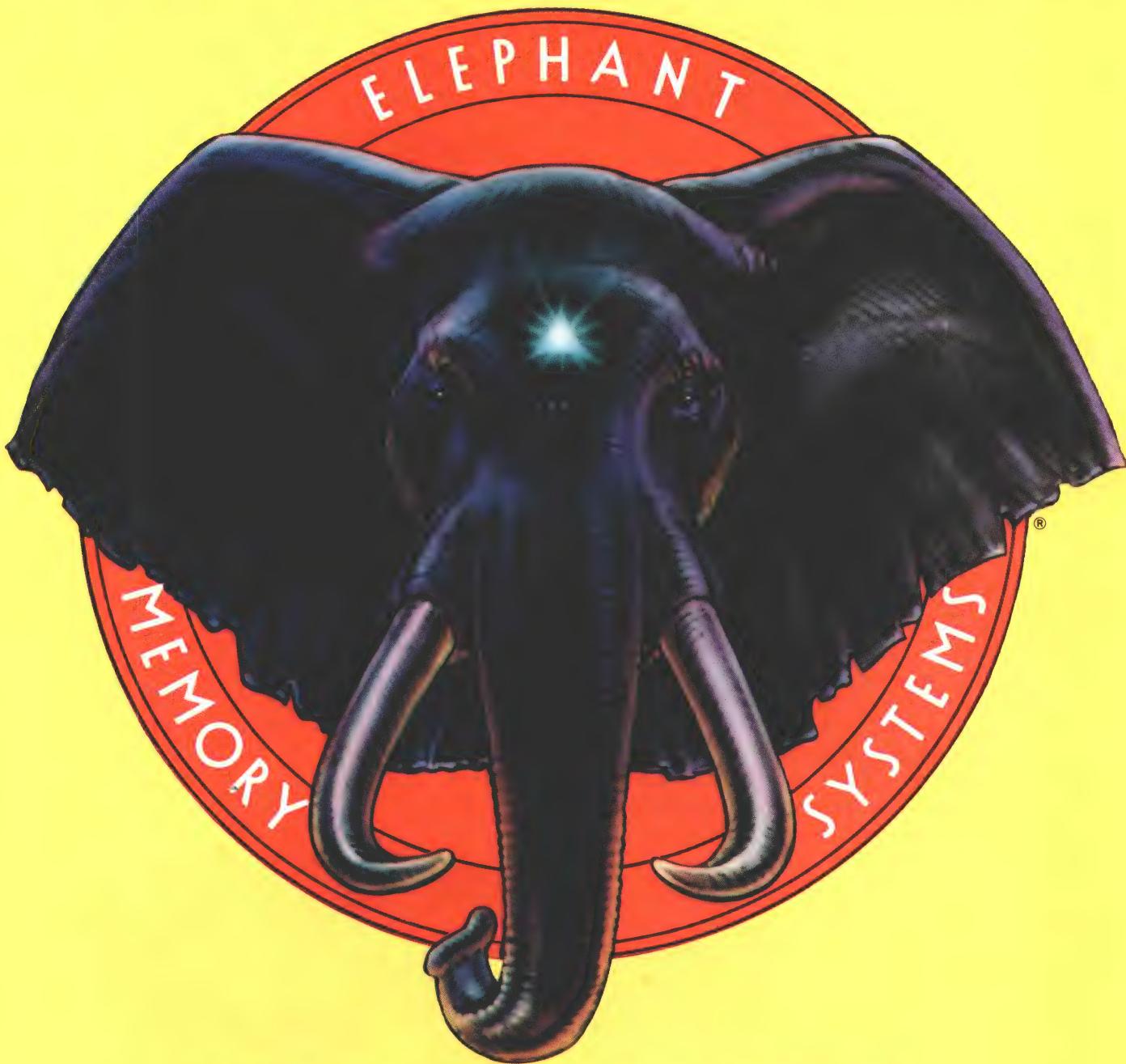
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Media Conversion

Janette Martin

Converting incompatible data to the PC may seem like a monumental task. But before you give up and start rekeying data, consider the alternatives. There are a number of conversion methods to choose from, all of which are less expensive than starting from scratch.

Do you have the conversion blues? They have nothing to do with religion or condominiums. The first thing to do is to check for symptoms. You automated your office a few years ago when a single dedicated word processor cost about \$15,000. Now your lease on the equipment is up, and you plan to buy PCs and organize an inexpensive network in which users can share mass storage and printing devices. Your equipment costs will drop substantially, and your data processing flexibility will increase dramatically. The only problem is that the PC can't read the data stored on all those disks used by the old computers. The cost of rekeying your data could negate the savings of the promising new system, and you could get stuck renewing leases on equipment you really don't want.

Whether you want to update an old system or automate for the first time, there are ways to avoid rekeying data when you convert to the PC. Through one or several channels, depending on your specific needs, you can transfer data on disks, paper, and magnetic tape to disks that can be read by a PC. These channels include service bureaus, telecommunications, disk conversion devices, optical character recognition (OCR) machines, and digitizing cameras (see Figure 1).

Passing the Byte

If the volume of data you need to convert is small, you may want to simplify your life and hire someone else to do it for you. There are several service bureaus that have offered media conversion services for incompatible word processors for years. These include Altertext, Racal-Telystems, and Datascan (see "Conversion Services and Products" for a list of addresses and phone numbers).

Datascan is the only one of these companies that currently has a full range of services for converting media to the 5½-inch, PC-DOS format used by the PC. The

You can expect to pay a service bureau 35 cents for converting a double-spaced page.

company provides a variety of media conversion services for the PC, including disk, 9-track tape, mag-card, paper-tape, and punched-card conversions. For example, Datascan can transfer data stored on IBM OS6 8-inch disks to PC-DOS 5½-inch disks. Datascan also provides conversion to the PC format from Displaywriter, Wang, Apple, TRS-80 Model II, Vydec, and CP/M 8-inch systems. The cost of disk conversion is based on the density and type of the source media. As a rule of thumb, you can expect to pay a service bureau 35 cents for converting a double-spaced page.

If your data is not on disk but was typed on paper with an IBM Selectric in a standard IBM font (Courier 10, Letter Gothic, OCR-B, or Prestige Elite), Datascan

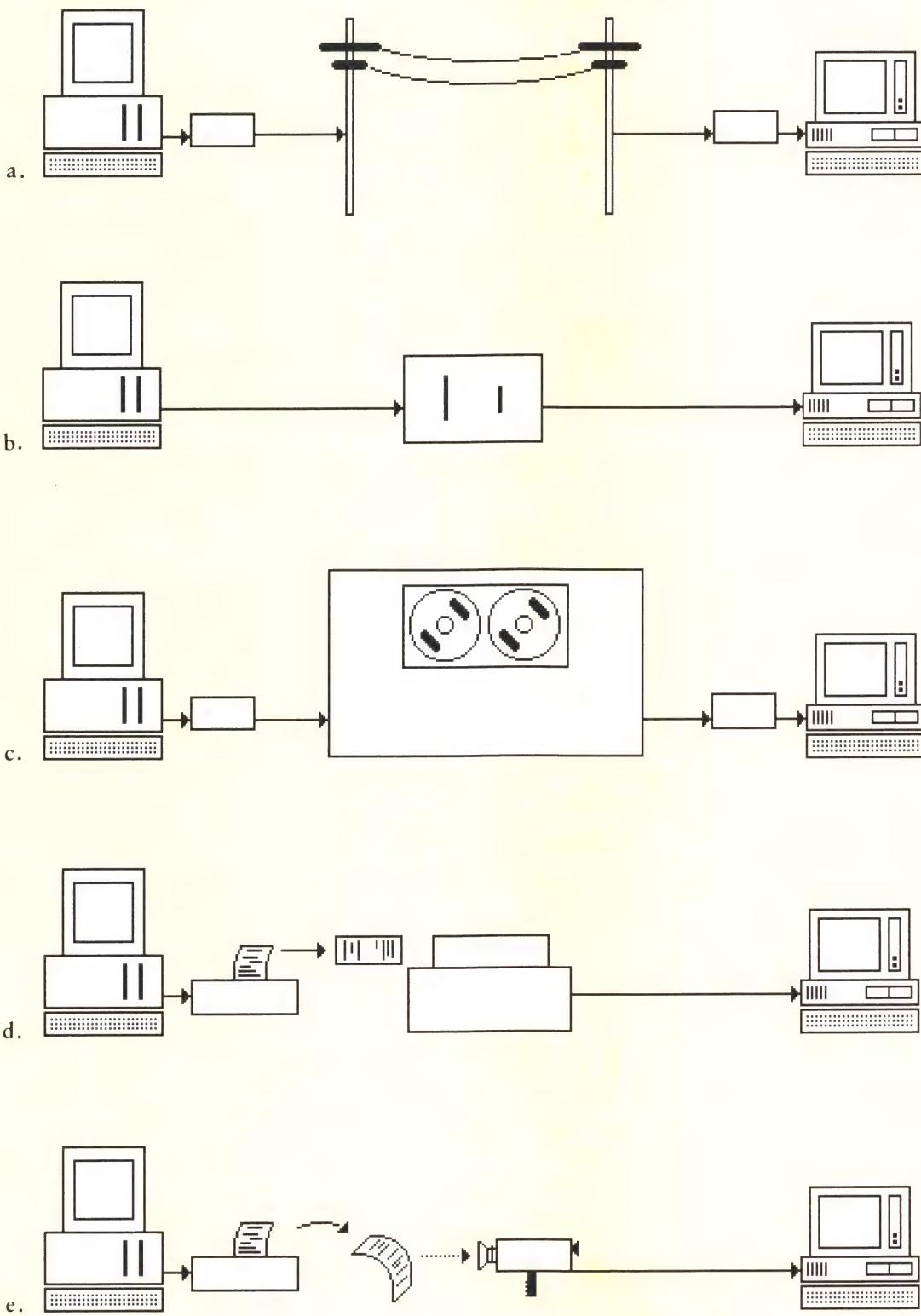


Figure 1: Five methods for converting data to the PC:
 (a) telecommunications, (b) mainframe conversion
 software, (c) disk conversion devices, (d) optical char-

acter recognition (OCR) machines, (e) digitizing
 camera

Hands On

can convert it to a PC-compatible disk using OCR equipment. An OCR reads typed characters and converts them to digital form. The information should be clearly typed on 8½- by 11-inch paper so the sheets can be fed into the OCR. OCR conversions to PC-compatible disks cost between 75 cents and \$1.25 per printed page.

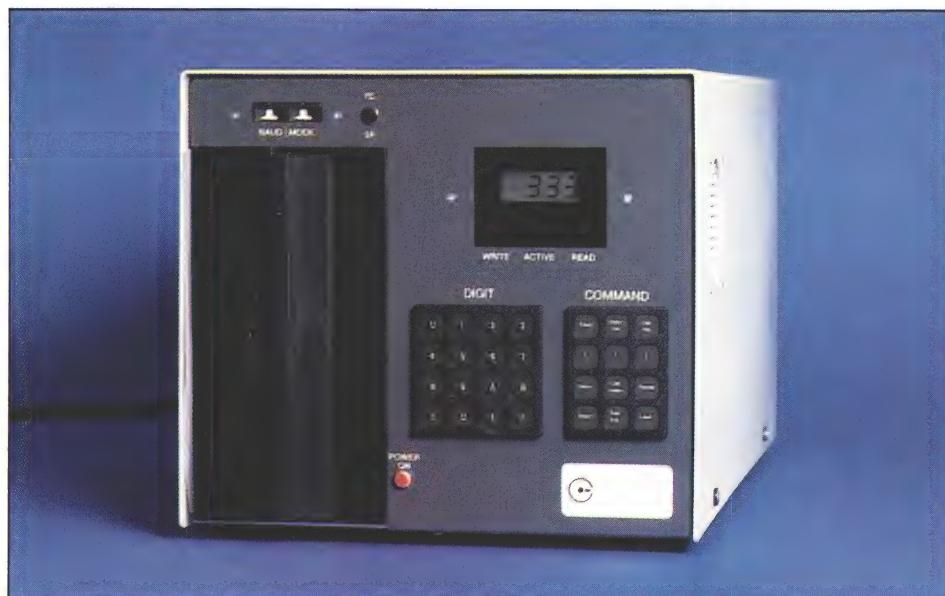
Two other companies that handle media conversion for PC users are Pivar Computing and Golden Computer Systems. Pivar Computing specializes in converting magnetic tape and microcomputer disks to PC-DOS 1.10 and 2.00 formats. Pivar Computing also provides conversions of Displaywriter and DEC WPS 8-inch disks to the PC format. Golden Computer Systems specializes in converting software from 8-inch and 5¼-inch disk formats to the PC format.

You should also consult the Yellow Pages for local service bureaus that provide media conversion services. Service bureaus are rare because the equipment needed to convert a wide range of media can be extremely expensive.

Be sure to get complete information from the service bureau about the output results before you commit yourself. Depending on the types of media involved and the PC software you want to use with the converted data, you may need to do a little to a lot of editing on the converted files before they can be used. Most media conversion services will run a low-cost test conversion for you so you can look before you leap.

Telecommunications

If you have your old equipment and a PC at the same time, and they both have a modem and compatible telecommunications software, you can send data in standard ASCII format from the old equipment to the PC through the phone lines. You should consult telecommunications specialists from both hardware vendors to ensure that the communications programs used between the two systems are compatible with each other. I transferred hundreds of Wang WPS files to my PC using Wang's asynchronous teletype software on the Wang and PC-Talk III on the PC.



If your old system has already been shipped before you receive your PC, consult a service bureau or another company that has the old system with communications capabilities. The service bureau can take your old disks and telecommunicate the data to your PC.

The service bureau may charge \$30 to \$60 per hour for a telecommunications session, and you should also calculate the costs in time and personnel of handling the receiving half of the conversion. Sending a full 8-inch disk at 1200 bps could take over an hour. It may be less expensive to have the service bureau handle the entire job for you.



Clockwise from upper left: Shaffstall's Media-com 3300, Totec's TO-5000 desktop OCR, Datacopy's Model 90 Integrated Imaging System, CompuScan's Alpha Word III + Page Reader, and Dest's Model 203 desktop OCR



One problem with telecommunications conversions is that, unlike most conversions handled by service bureaus, they do not allow any code translation between media. If you send Wang files to the PC in ASCII format, codes such as tabs, indents, and underlines will be stripped. However, except for the lack of those print enhancements, the ASCII file will look the same when printed from the PC as it looked when printed from the Wang.

Code Conversion Software

If you frequently need to transfer files between dedicated word processors and the PC, you may want to buy conversion software. *Soft-Switch* from Integrated Technologies, Inc. (ITI), provides conversions with full code translation using an IBM mainframe as the translator. The

conversion software comes in modules for use with dedicated word processors, with IBM mainframe computers, and with word processing software on the PC. Specific modules support the Displaywriter, Wang, Xerox, and Lexitron dedicated word processors as well as *WordStar* and *MultiMate* on the PC. A module for IBM PROFS is also available for transferring mainframe word processing files and distributing files through mainframe terminals and PCs.

If you don't have access to an IBM mainframe, ITI will provide the name of a time-sharing company that has *Soft-Switch* on an IBM mainframe. You can then send your dedicated word processor files to the mainframe, where they can be downloaded to your PC. To use

Hands On

this system you will still need to purchase the *Soft-Switch* modules for your dedicated word processor and PC word processing program.

ITI claims that *Soft-Switch* provides complete code translation between systems; a Wang file sent through *Soft-Switch* to a PC can be picked up in *MultiMate* and will look like it was created in *MultiMate*. Print enhancements, word wrap, and other control codes remain intact. At this writing ITI's complete transfer program is yet to be finished. The mainframe module costs \$20,000, and each word processor module costs between \$5000 and \$10,000.

For owners of IBM's Displaywriter dedicated word processor, there is yet another alternative for converting data to the PC. As part of a master plan for compatibility among IBM machines, IBM has announced a \$495 connection kit that consists of a cable and two disks. The kit allows data to be transferred back and forth between a Displaywriter and a PC. To further improve compatibility, IBM has introduced a series of *DisplayWrite* word processing programs for the PC, the PC XT, and the PCjr that imitate the commands and functions of the dedicated Displaywriter.

Disk Conversion Devices

If you need to convert a large amount of data, you may want to purchase your own conversion device. Two companies that make disk-to-disk conversion devices for the PC are Flagstaff Engineering and Shaffstall Corporation. Flagstaff makes two types of disk readers that read and write 8-inch disks and connect directly to the PC. One model has a single drive, and the second model has two drives—one read/write drive and one hard disk drive that stores up to 1.2MB of data.

Both of the Flagstaff disk readers come with two types of utility software for data transfer and code translation between 8-inch disks and the PC's disks. The File Connection utility converts source and data files from CP/M 8-inch, IBM 8-inch, TRS-80 Model II, and DEC RT 11 formats to PC-DOS and vice versa. The Word Connection utility converts word processing files from such dedicated systems as the Displaywriter, CPT, DEC WPS, NBI, and OS6 and from PC word processors such as *WordStar* and *MultiMate*. The disk readers accept single- or double-sided, single- or double-density disks with 128, 256, 512, or 1024 bytes per sector.

Flagstaff's single-drive disk reader costs \$1445, and the double-drive reader costs \$2145. Software modules supporting various media conversions cost \$395 to \$595 each.

Shaffstall makes two disk readers, the Mediacom 3300 and the Mediacom 5000. The Mediacom 3300 reads and writes 8-inch disks, and the Mediacom 5000 reads and writes both 8-inch and 5½-inch disks. Both readers connect to the PC through the serial port. Communications software is required for file transfer.

Shaffstall offers 30 software modules to use with the readers for various media conversions. These include modules for Wang (5½- and 8-inch), Xerox, NBI, CPT, IBM, NEC, Osborne, Lanier, TRS-80, and more. The Shaffstall readers allow code conversion, and Shaffstall supplies code conversion charts for popular software packages.

Installation, training, and one software module are included with Mediacom 3300 (priced at \$11,000) and Mediacom 5000 (priced at \$16,500). Additional modules are \$1350 each.

Optical Character Recognition

If you need to convert large volumes of typewritten material on an ongoing basis, you might consider buying an OCR machine. If your computer's disk format is not recognized by conversion devices, you may be able to print out text in a font that an OCR can recognize. OCR machines either plug into the PC's asynchronous communications board (the RS-232C serial port) or come with a special board that fits in an expansion slot. Communications software is usually required.

OCRs have improved in quality and come down in price in recent years. If you process data from a variety of incompatible sources, an OCR may be the best way to save you from retying hard copy. OCRs enable you to input data on the PC in less time than it would take you to rekey it—and with less chance of error.

With any OCR the quality of the typewritten material affects the quality of the converted output. If a typewritten character is unevenly shaded or broken, the OCR may not be able to read the character correctly. Most OCRs flag unidentifiable characters so you can edit them on disk.

Dest, Totec, and CompuScan make compact, desktop OCRs that convert typewritten material in a variety of fonts to the PC format. Dest offers two basic OCRs, the Model 202 and the Model 203. The Model 202 reads a page in 25 seconds, and the Model 203 takes only 15 seconds to read a page. Up to 75 sheets of typewritten material can be inserted into the OCR's automatic sheet feeder. The Model 202 costs \$7000 and comes with a module for reading the Courier 10 font. Modules for identification of other fonts cost about \$500 each. Up to eight font-identification modules can be installed on one OCR. A format processor can be purchased for \$1500 to connect the OCR to the PC to achieve the best possible formatting results. Without the format processor, files may require extensive editing to eliminate carriage returns and control characters.

Conversion Services and Products

The following companies provide services, software, and hardware for converting data to the PC. Check the Yellow Pages for additional sources.

Services

Altertext
210 Lincoln St.
Boston, MA 02111
617/426-0009

Racal-Telesystems, Inc.
410 N. Michigan Ave.
Chicago, IL 60611
312/329-0700

Datascan, Inc.
2716 Ocean Park Blvd.
Santa Monica, CA 90405
213/452-9114

Pivar Computing Services, Inc.
47 W. Dundee
Wheeling, IL 60090
312/459-6010

Golden Computer Systems
2303 Lake Harbin Rd.
Morrow, GA 30260
404/961-2485

Software

Integrated Technologies, Inc.
200 N. Warner Rd. #414
King of Prussia, PA 19406
215/768-9330

IBM

Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/447-0890 Alaska
and Hawaii, 800/322-4400 Illinois

Disk Conversion Devices

Flagstaff Engineering
2820 W. Darleen
Flagstaff, AZ 86001
602/774-3588

Shaffstall Corporation
7901 E. 88th St.
Box 50990
Indianapolis, IN 46250
317/842-2077

OCR Devices

Dest Corporation
2380 Bering Dr.
San Jose, CA 95131
408/946-7100

Totec Co., Ltd. USA
19151 Parthenia Ave., Ste. A
Northridge, CA 91324
818/993-9413

CompuScan, Inc.
81 Two Bridges Rd.
Fairfield, NJ 07006
201/575-0500

Caere Corporation
100 Cooper Ct.
Los Gatos, CA 95030
408/395-7000

Key Tronic Corporation
P.O. Box 14687
Spokane, WA 99214
509/928-8000

Bi-Tech Enterprises
10B Carlough Rd.
Bohemia, NY 11716
516/567-8994

BancTec
800 E. Main St.
Norristown, PA 19401
215/277-0500

Imaging Systems

Datacopy Corporation
1215 Terra Bella Ave.
Mountain View, CA 94043
415/965-7900

Totec's TO-5000 desktop OCR reads up to 300 characters per second (cps) and can handle up to 30 typewritten sheets in its automatic sheet feeder. The TO-5000 retails for about \$10,000, with one font-identification module and a format interface included.

Both Dest and Totec OCRs recognize a number of popular IBM typewriter fonts including Prestige Pica, Prestige Elite, Letter Gothic, OCR-A, OCR-B, and Courier. At this time the Dest and Totec machines (like most OCRs) do not read dot matrix print.

CompuScan makes an OCR called the AlphaWord III + Page Reader that reads eight standard fonts. When used with CompuScan's *LineScan* software, the Page Reader can scan line by line, rather than character by character, to speed up conversion to 300 pages an hour. The reader, with software, costs \$30,000. CompuScan also makes a less sophisticated OCR called the Alpha-Word Series 80 that retails for under \$10,000.

If you want to convert lines of OCR font, credit card sales slips, computer-generated invoices, or store price tags, you can use an OCR data entry device designed especially for converting such data to the PC. The Caere Corporation's Series 500 OCR system is a hand-

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- 5 --> REPORTS
- 6 --> VERSION
- 0 --> TO EXIT

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Hands On

held wand reader that attaches to an expansion board in the PC and sells for \$1145. The wand can record any text image composed of up to 80 characters. You can program the wand to read only specified formats by defining field lengths and character types.

Key Tronic makes a hand-held OCR reader that plugs into a Key Tronic keyboard attached to the PC. Bi-Tech Enterprises and BancTec also make hand-held OCR devices for the PC.

Getting the Picture

For those who need to convert photographs or drawings to disk, a digitizing camera is available from Datacopy. With the digitizing camera you can even put your dog Fido on disk, along with any other three-dimensional object. Common applications for the camera are signature verification and the capture and storage of images for integration with text. Datacopy's Model 90 Integrated Imaging System includes a camera, an interface board, and menu-driven software for the PC for \$9945.

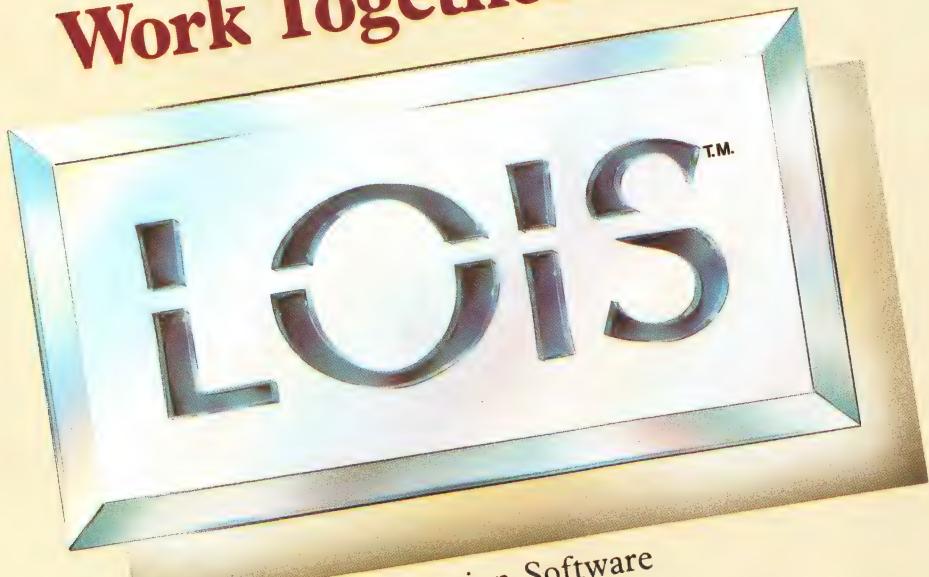
The Datacopy system uses a standard 35-millimeter camera lens that incorporates an analog-to-digital converter. The camera processes images into computer-readable digital code, breaking the optical image into 1728- by 2846-pixel resolution. Two scanning modes are available: threshold mode for converting text and line drawings and half-tone mode for converting three-dimensional objects and pictures. The half-tone mode uses gray scaling to shade and contour the converted image. The image is reduced for storage and display, but a capture window controlled from the PC can select sections of the image to zoom in on. The image can be displayed, printed on an Epson printer, or stored on disk (a hard disk is recommended).

Shaking the Blues

Conversion is never an easy process, but it needn't be painful once you find the conversion method your situation requires. Analyze your options by testing in advance and compare the cost and performance of all alternatives. Once data is on the PC, converting it from one program to another is much easier than converting between computers. With a little planning, you can say good-bye to the conversion blues forever. ☺

Janette Martin is a Contributing Editor for PC World. She owns an information processing company in San Francisco that specializes in training services for the PC.

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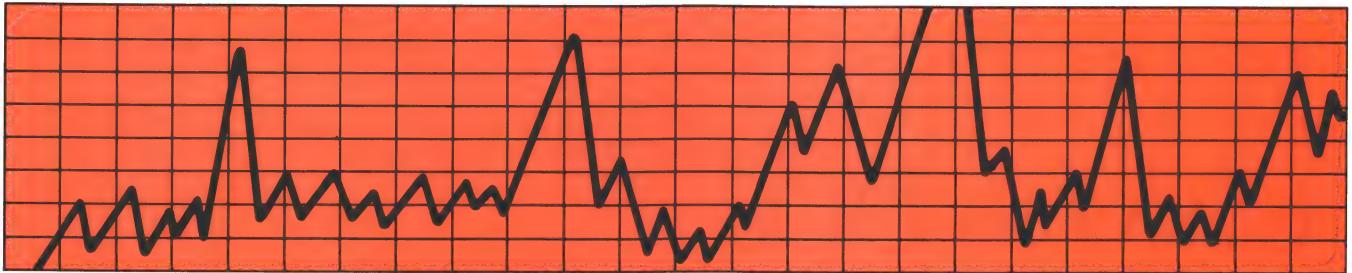
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CP/M to DOS

Perfect Software's Perfect Link communications program includes a helpful utility for converting data to and from the PC.

Steven D. Ryals

Back when I bought my first Osborne computer, the IBM PC was still a gleam in a Florida design team's eyes. I happily spent hundreds of hours learning to use *WordStar* and *dBASE II*, never giving a thought to the day when I might want to graduate to a more sophisticated system. Then, after I had laboriously programmed numerous applications on the Osborne, I found myself wanting the increased power, storage, and status that only an IBM PC or compatible machine could give.

Due to my fears about transferring all my CP/M programs to MS-DOS, I put off buying a new computer for several months. Finally, a deal came along that I couldn't refuse, and I found myself the proud owner of a Compaq. I also found myself wondering how in the world I was going to move my *dBASE II* and *WordStar* files over from my Osborne.

Sure, I could transfer the files with two modems and the requisite software and cables. Or I could get communications software and a null modem cable and hard-wire the files from the Osborne to the Compaq through their RS-232C ports. But both methods involved considerable time and expense, and I would be stuck with equipment I had no im-

mediate need for. I considered using a file transfer service, but I didn't want to wait for the disks to be mailed back and forth.

I was beginning to ask myself whether it might not be easier to re-type all of the programs and data files into the Compaq. But since I intended to continue to use the Osborne for business applications, I wanted a way to transfer files in both directions. With all these considerations, I wound up with the Osborne sitting on the floor while I became better acquainted with my Compaq. One sunny day I received a flyer from a mail-order software firm offering a special price on a program from Perfect Software called *Perfect Link*. This new member of an integrated line of software called *The Perfect Library* is promoted as a communications package designed primarily to access services like The Source and CompuServe. Since I was not ready to buy a modem, communications didn't interest me. However, what did pique my interest was the claim that *Perfect Link* could read and write between disks formatted on over 20 different CP/M and MS-DOS computers, all without modems or cables. I ordered a copy immediately.

When it arrived a few days later, I dropped everything and opened the package. It consisted of two disks and a well-organized, indexed manual more than 300 pages in length.

Because the wireless file transfer portion of *Perfect Link* seems almost an afterthought, I had to do a bit of searching before I found the instructions I wanted, buried in chapter 16. The information was presented in a clear, logical format.

Perfect Link lets you specify multiple file transfers with the DOS wild-card format.

The Conversion

The first thing to do after starting up the program is press the <Home> key, which brings up the main menu. Pressing <F9>, either from the opening screen or from the main menu, brings up the utility menu. Pressing <F6> from the utility menu brings up the Disk Transfer menu (see Figure 1).

The current, or default, settings are displayed on the right side of the Disk Transfer menu. To change the CP/M format, I pressed the <F3> key and was rewarded with the Disk Format menu (see Figure 2). Pressing <F6> from this menu changed the



Figure 1: Perfect Link's Disk Transfer menu provides a variety of functions for converting data from CP/M to DOS and vice versa. The default mode is listed on the right.



Figure 2: Perfect Link's Disk Format menu opens up as a window over the Disk Transfer menu. The Disk Format menu allows you to choose the specific disk formats used by the originating computer.

● Hands On

CP/M format to Osborne double density. Pressing the <End> key backed me into the Disk Transfer menu, and from there all I had to do was press the <F7> key to copy data from CP/M to DOS.

I inserted the target disk formatted for MS-DOS into drive A: and the CP/M disk containing my Osborne files into drive B: and pressed <Enter>. I then typed in the name of the file to transfer and pressed <Enter>. The file was transferred quickly and accurately.

If there is any question as to what files to transfer, the disk transfer menu lets you look at the directory of the CP/M (source) disk by pressing the <F5> key. Once the transfer is completed, you can look at the directory of the DOS-formatted disk with the <F6> key to make sure the file you wanted was transferred. *Perfect Link* also lets you specify multiple file transfers with the DOS wild-card format.

I set up and transferred a full disk of CP/M files to an MS-DOS disk in less than 5 minutes. The entire operation of this wireless file transfer was accomplished by pressing function keys—a feature certain to be appreciated, especially by nontechnical users.

Once all of my files were transferred, the only thing I had left to do before running my *dBASE II* command programs was to change the file extension from the one that the CP/M version of *dBASE II* looks for (.CMD) to the one that the MS-DOS version recognizes (.PRG). I used the DOS RENAME command to take care of this chore. I was then able to run all of the programs I had worked so hard to create. Of course, MS-DOS will not run CP/M system programs or other machine-specific programs, and CP/M won't have anything to do with MS-DOS programs, but all the programs I had converted to ASCII data files made it across in

fine shape. If I had known about *Perfect Link* all along, I wouldn't have been so traumatized and paralyzed by the dread of conversion. ●

Steven D. Ryals is a dBASIC II consultant and writer living in Oakland, California. He specializes in developing business applications for microcomputers.

Perfect Link

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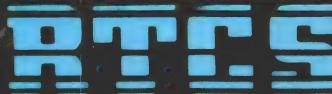
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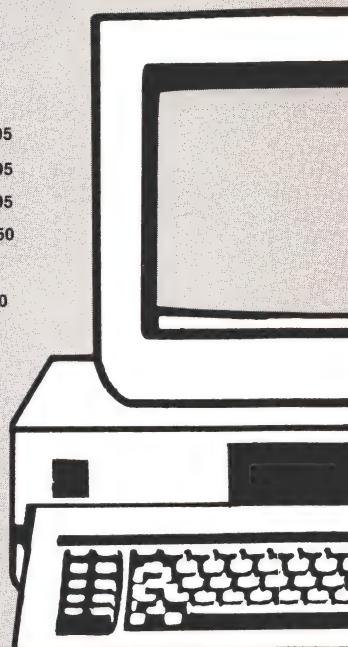
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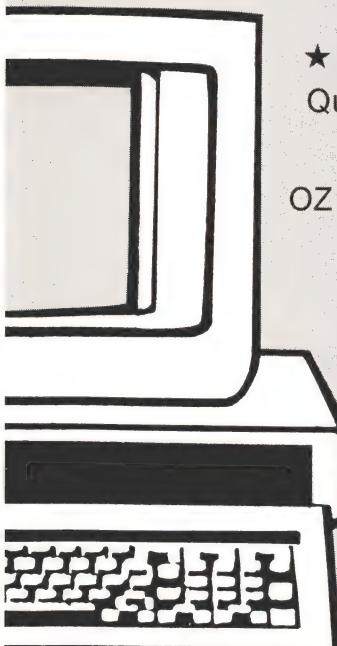
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Professional Presentations

*Don't let presentation stage fright get you down.
Here are some simple guidelines to ensure a
successful presentation.*

Bill Crider

Most of the new crop of business graphics packages for the PC are fairly easy to learn and to use. A busy executive with no graphics experience can usually break open a graphics package and throw together some bar charts or line graphs in a matter of hours. Yet high-quality software and hardware do not necessarily ensure a successful presentation. You may have the most sophisticated printer, plotter, slide generator, and graphics software available and still ruin a presentation with a poorly designed slide or an overused printer ribbon.

Computer graphics can be used as a creative tool for artistic expression and experimentation, but for most business presentations, you should avoid the temptation to include every graphics feature available. In those situations it is more important to communicate than to impress. Following the practical and aesthetic

guidelines in this article will help ensure a successful presentation. At the very least it will ensure that your graphic aids don't detract from the message you want to communicate.

Keep It Simple

Whatever message you are presenting, give thought to the order of your material. Don't organize chronologically; instead, start with what your audience knows and move to what they do not know. Begin with a simple concept and move to a complex one. If you start with material your listeners accept, they will more easily credit controversial statements.

Put yourself in the place of the audience. What would you want to hear? What would you be expecting? Consider how you would react to each of your points. Do you want your audience to be relaxed or defensive? Amused or impressed? Remember, people are more often convinced by how they feel than by what they hear.

It is crucial that you keep your material succinct. If you have more than three main points, you will probably

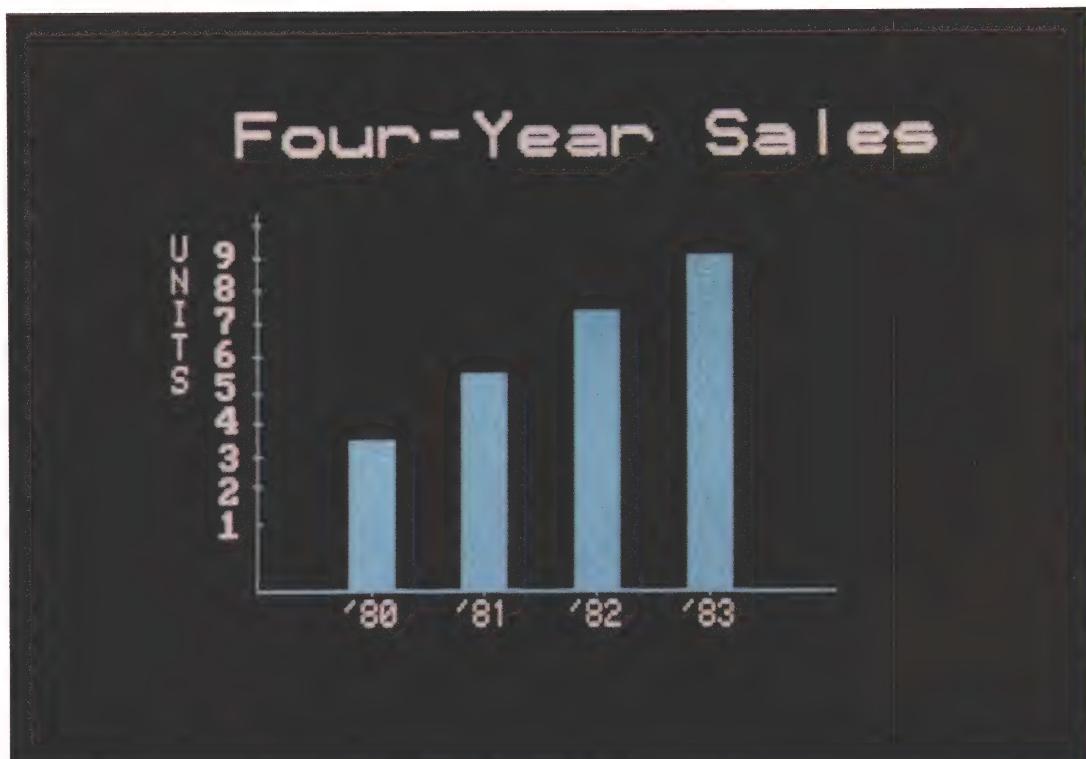
lose your audience. If you cannot state the point of the presentation in one sentence, you need to rethink your goals. One good technique for crystallizing the content is to write the last paragraph first and work backward.

A presentation without graphics is like a room without windows—dull. Appropriate graphics can set the mood, illustrate points, and make the presentation memorable. However, inappropriate graphics can easily ruin a presentation. Graphics should direct attention to the idea you are presenting, not distract from it. Icons and logos are usually appropriate. Flashing borders and purple stick figures are not.



● Hands On

Figure 1: Sample bar chart created with ExecuVision. Design the screen in thirds. The top (or left) third should contain the title. The bottom (or right) two-thirds are for art and smaller type.



The PC Slide Show

The graphics capabilities of the PC enable you to create a new form of visual aid—the on-screen “slide” show. You may have seen these in computer stores as ads and tutorials for software. The slide show consists of a series of screens that are called up by the computer in sequence. Screens can be timed to change automatically or can be controlled from the keyboard.

Timed slide shows, such as those created by *PC Projector* and *4-Point Graphics*, proceed after showing each screen of information for a specified time. If you use a timed presentation, be sure to choose an appropriate amount of time for each slide. Have someone read each slide while you time them. Multiply the minimum time by 1.5 and use the resulting figure.

As an alternative to timed presentations, some packages, such as *Pyxel Visuals* and *Energraphics*, allow you to advance the screens at the press of a key. *Execuvision* allows you to move both forward and backward through the displays by pressing the cursor control keys. The *Executive*

If you are going to give a presentation to more than five or six people, you should consider making photographic slides of the screen rather than crowding everyone around a monitor. If you are a photographer, you may want to do this with standard camera equipment. (See “Screen Shots,” *PCW*, Vol. 1, No. 5, for some hints on camera technique.) If you want to simplify matters, you can buy a slide generator that attaches to your PC (see “60-Second Slides” in this issue).

Avoid the temptation to put too much on a screen.

Picture Show goes even further by branching the presentation in response to viewer interaction such as a yes or no answer or a menu selection. Basing the flow of your presentation on user interaction allows you more flexibility in coordinating your talk with your visuals. Branching lets you give several versions of a slide show using the same materials.

Designing a Screen

Avoid the temptation to put too much on a screen. Each screen should convey only one concept. The most effective method of designing a screen is to think of the screen as being divided into thirds. The top (or left) third should contain a title composed of letters about 1 inch tall with

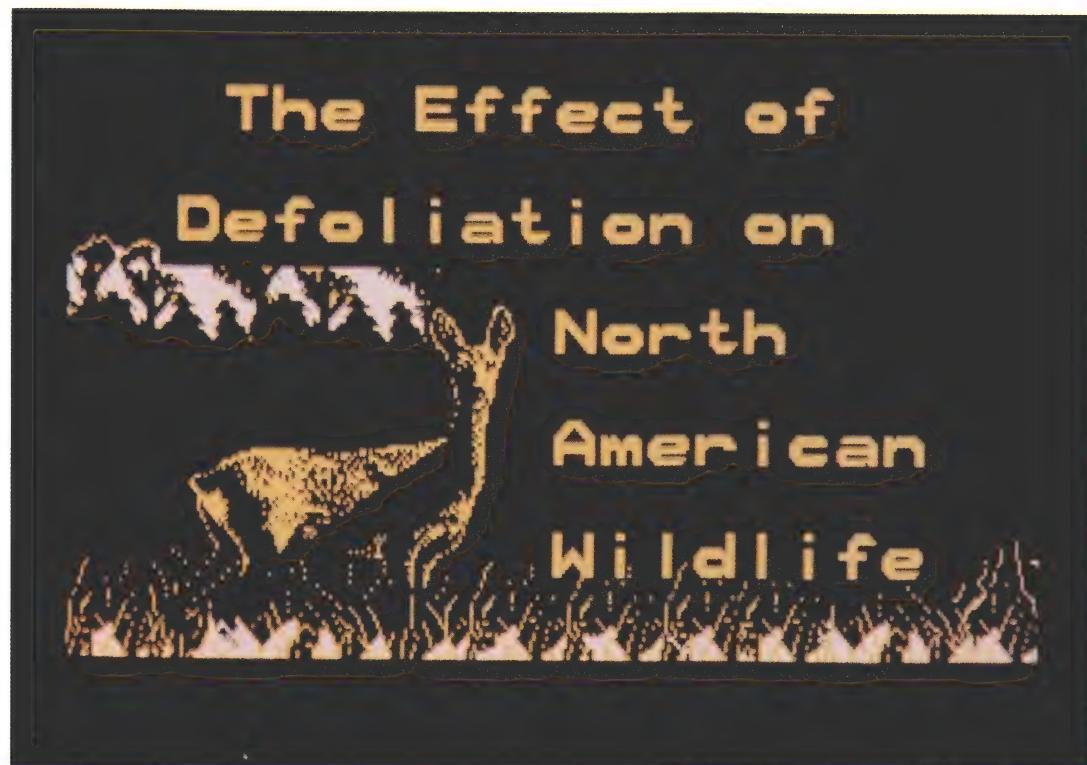


Figure 2: Picture created with ExecuVision. Letting the picture continue off the edge of the page gives the illusion that the picture is larger.

enough empty space around it to make it stand out. The bottom (or right) two-thirds are for art or smaller type. If the art consists of charts or graphs, they should be surrounded by a $\frac{1}{4}$ -inch margin (see Figure 1). If the art consists of pictures, let them continue off the edge of the screen. This creates the impression that the pictures are larger than they really are (see Figure 2).

Use only one color for the type unless you want a single word to stand out. If the graphics software allows several type styles, use one that is easy to read. Displaying letters in script, italic, or Old English fonts may seem like a good idea, but if people have trouble reading them, you destroy the impact of the message.

It is usually most effective to use one overall color for a screen and to trim it with other colors. Be aware of the effect of color on the viewer: subdued colors create a mood of trust; bright colors cause a mood of surprise (and hence, caution); and using too many colors creates confusion. Don't go from a screen with a dark background color to one with a bright background color. The effect is disconcerting and detracts from the content of the screen.

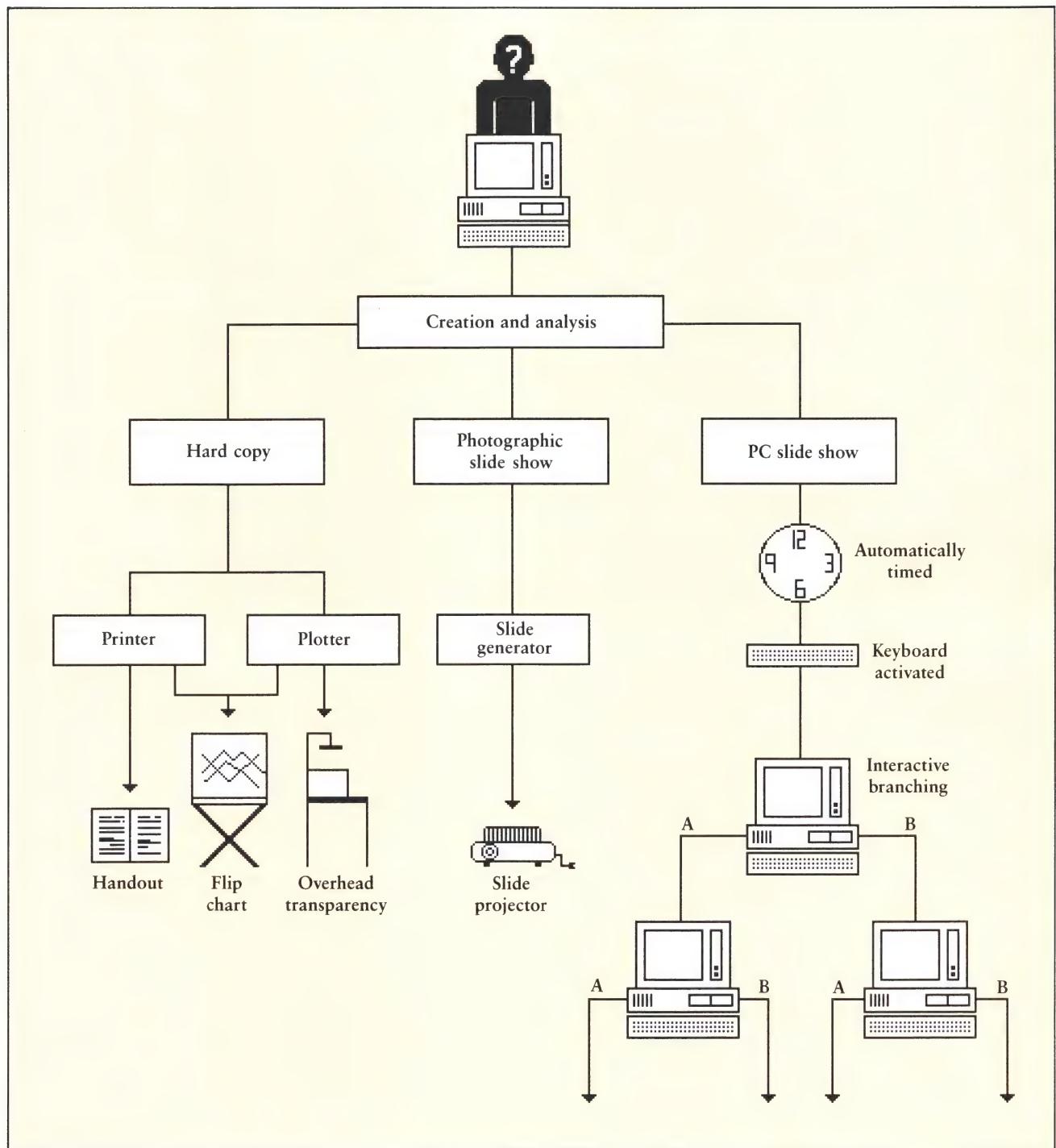
Some graphics programs (notably *Energraphics*, *4-Point Graphics*, and *Executive Picture Show*) allow you to integrate motion into your presentation—an effective technique if it is not overused. The on-screen demonstration that accompanies *Execuvision* shows both bad and good uses of motion. On a screen relating to computers in laboratories, an animated mouse runs across the floor. This has nothing to do with the topic

and only distracts the audience. The same demonstration shows some excellent uses of motion: distribution centers "growing" like flowers, and bars representing sales rising before your eyes. The *Executive Picture Show* has a unique type of motion called a "scenario," which enables you to show the steps involved in creating the screen as part of the presentation.

Font Programs

Although computer slide shows are growing in popularity, the most common medium for graphics presentations is hard copy. Hard copy is usually created on a printer or a plotter and is displayed on a handout, a flip chart, or a transparency. With hard copy you will be more concerned with pages than screens, although

● Hands On



Presentation graphics alternatives: from idea to output

you will be integrating screens of information into the printed material.

Making hard copy gives you an additional tool to work with—font programs. These are programs that allow you to print in different type styles and sizes. A font program is especially important if you do not have graphics in your presentation. Essentially, a font program is a printer driver that formats an ASCII text file based on commands you embed with a word processor. You specify the fonts you want to use by embedding commands within your document. Then the font software controls the printing.

Make certain the font program supports the printer or plotter you are using—font programs are usually

You can print a chart with a graphics program and then print text around it with a font program.

device-specific. Also, be sure it has the fonts and sizes you desire. Some programs are very limited, while others even allow you to create your own fonts. Once again, try not to get carried away. If you use too many fonts or font sizes on one page, you will distract your audience from the concept you are trying to communicate.

Getting standard text, special fonts, and art all on the same page in the correct positions requires planning. You can resort to scissors and glue, but why not use the capabilities of the computer? It is not difficult to print the text and fonts in one pass, then roll the paper back and print the art in another. Multiple passes also allow you to use a plotter to prepare the artwork and a printer for the text

Sample Graphics Software

The following graphics packages are mentioned in this article:

PC Projector	Executive Picture Show 0.3
PC Solutions	PCsoftware of San Diego
628 Hobart Terr.	9120 Grammercy Dr. #416
Santa Clara, CA 95051	San Diego, CA 92123
408/243-4169	619/571-0981
List price: \$39.95 (includes PC Title)	List price: \$195
Requirements: 128K, one disk drive, color graphics board	Requirements: 128K, two disk drives, color graphics board
4-Point Graphics 1.0	Execuvision
Imsi Software Publishers	Prentice-Hall, Inc.
633 Fifth Ave.	Route 9W
San Rafael, CA 94901	Englewood Cliffs, NJ 07632
415/454-7101	201/592-3283
List price: \$195	List price: \$395
Requirements: 128K, color graphics board	Requirements: 128K, two disk drives, color graphics board
Energraphics 1.2	Pyxel Visuals 1.5 (font program)
Enertronix Research, Inc.	Pyxel Applications
150 N. Meramec #207	2917 Mohawk Dr.
St. Louis, MO 63105	Richmond, VA 23235
800/325-0174, 314/725-5566	804/320-5573
List price: \$350, plotter driver \$100	List price: \$98
Requirements: 128K, color graphics board	Requirements: 128K, color graphics board

(plotters do not normally produce small type as well as printers do). You can also print a chart with a graphics program and then print text around it with a font program.

Making Transparencies

Once you have generated a hard copy, it is easy to make transparencies for an overhead projector. Almost any print shop can make them for 50 cents to \$2 per sheet. Some shops even make multicolor transparencies. If you have a photostatic copier in your office, you can probably make the transparencies yourself, but be sure to read the copier's in-

struction manual first. Not all copiers make transparencies, and those that do may require special switch settings to do so. If your copier does make transparencies, be sure to use the correct material; not all clear plastic or mylar intended for transparencies is suitable for photocopying. If you use the wrong kind, you can end up with a sticky, smelly mess that will cost you hundreds of dollars to clean up.

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NEC SPIN 3530	1549	EPSON FX100	CALL
NEC SPIN 3550	1850	PRISM 132	CALL
C. ITOH F10 (PAR)	1149	C. ITOH PROWR. 1	375
BROTHER HR 1	749	C. ITOH PROWR. 2	675

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AMDEK 300 Green	149	NEC JC1203	CALL
AMDEK 300 Amber	159	PRINCETON HX12	569
AMDEK Color II	469	ZENITH ZVM-121	100

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Hands On

If you have a plotter, you may be able to print directly on the plastic or mylar sheets. Since not all ink will dry on mylar, be sure you have the right pens for the job. A number of products for enhancing your transparencies are available from art supply stores, including colored mylar, color stick-ons, and colored pens for direct drawing.

In general, presentations using transparencies should use a "progressive revelation" approach. Don't show an entire transparency at once; if you do, your audience will be more concerned with reading ahead of you than with listening to what you say. You can avoid this problem by using masks or overlays. A mask is a sheet of paper that you slide down the transparency as you speak, uncovering each point at the appropriate time. Use a heavy piece of plain paper for the mask so writing won't show through.

An overlay is a second transparency laid on top of the first. The art or type on the second should fit the art on the first, like pieces of a puzzle. This is an effective technique to use with charts, so you can show part of a chart at a time. You can use four or five overlays before the thickness of the mylar makes the projected image unreadable, but you will probably find that using more than two overlays on one base sheet becomes cumbersome. The biggest problem with overlays is getting them to align correctly. It is easy to get one reversed, and they often slip around as you are speaking. You can solve these

problems by taping the sheets together at the top or the side with transparent tape, then folding them together like pages of a book.

When you store transparencies, do not lay them directly against each other; the ink or electrostatic toner may transfer from one sheet to another. The sheets may stick together permanently. Even typewriter ink on a sheet of paper will eventually transfer to them. Store transparencies in a file folder or notebook with a sheet of plain white paper between them.

Legibility is even more important for screen projections than for handouts. Use a good ribbon when printing transparencies, and make sure they are sharp and clear. Arrange your transparencies in the order in which they will be used before you start your presentation, and be sure you have a place to lay them after they are used. Clean your projector lens with a soft, lint-free cloth before you begin. Position the screen to avoid glare. The lighting in the room should be subdued—not dark. And one more thing—don't forget to bring a spare projector bulb. ●

Bill Crider, formerly managing editor of Computer Skill Builders, is a freelance writer and computer training consultant in Tucson, Arizona.

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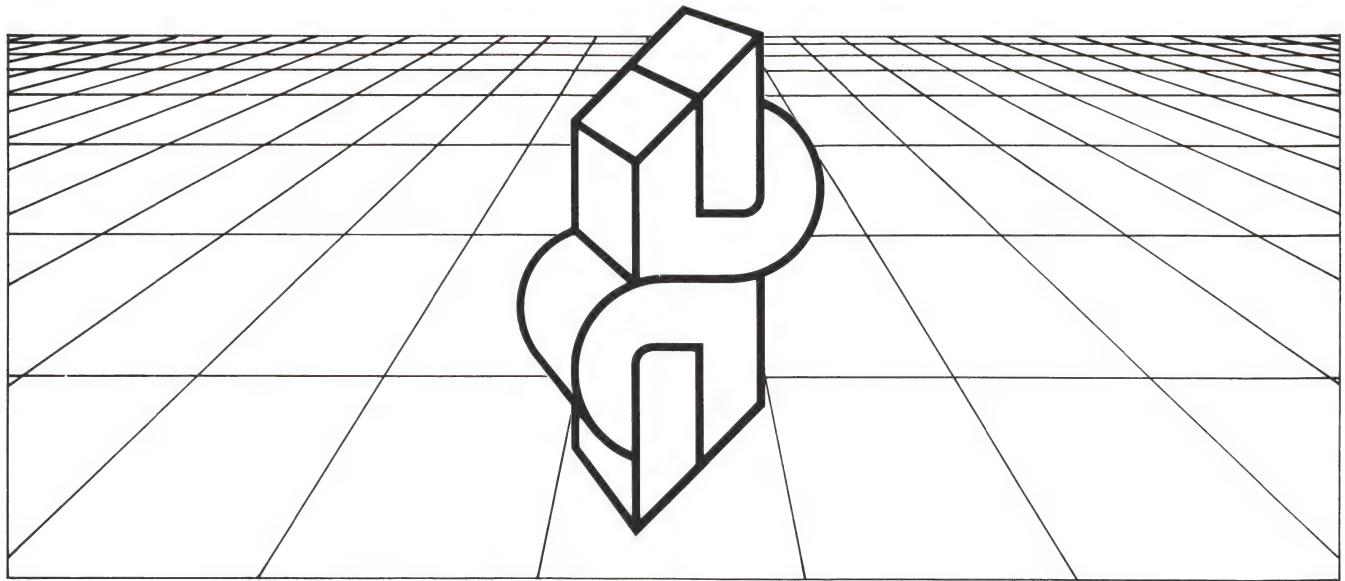
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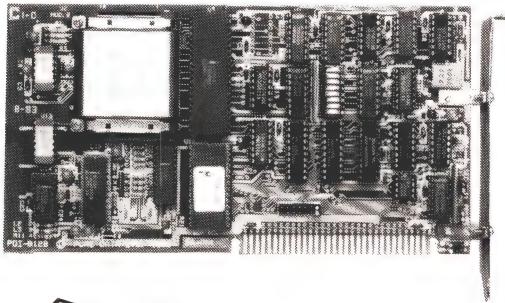


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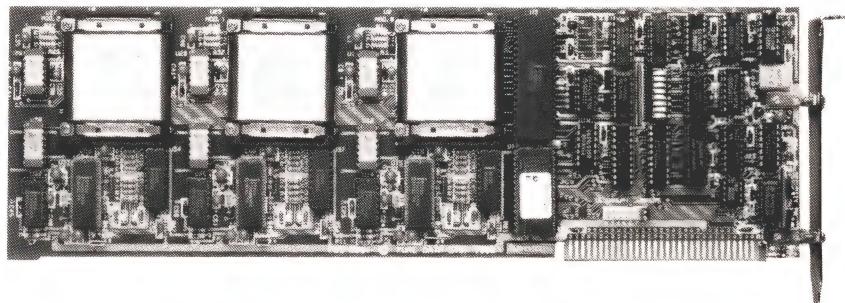
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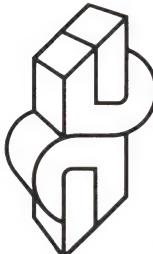
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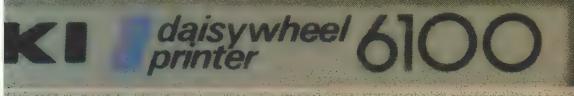
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Orig. + 3 copies or more	●	●	●	●	●	●	●	●	●			
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Note: Above chart is an art treatment and was not printed by the JUKI 6100.



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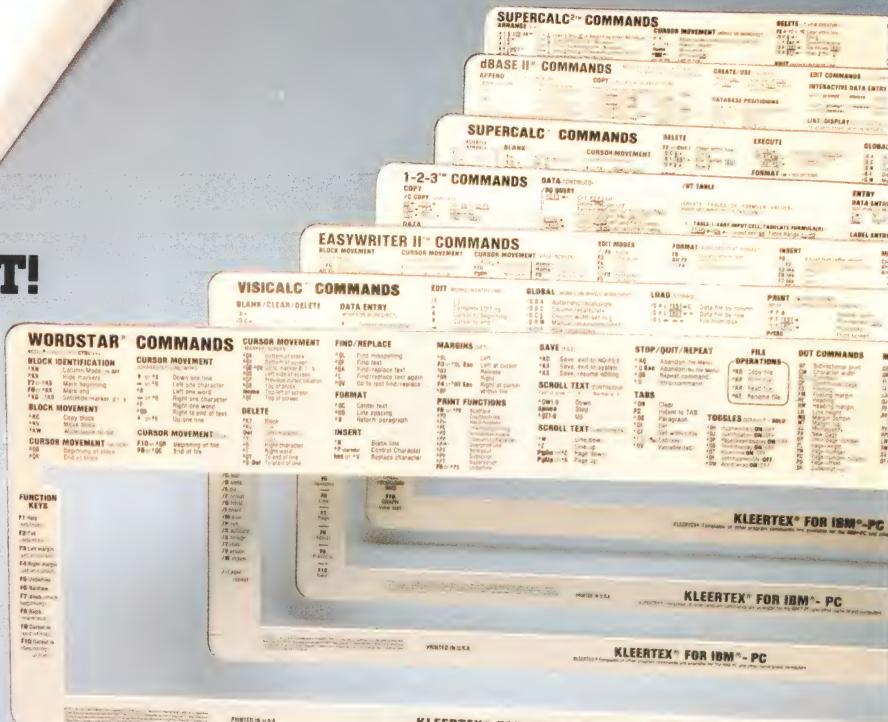
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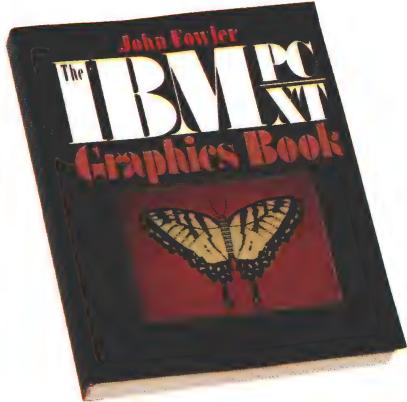
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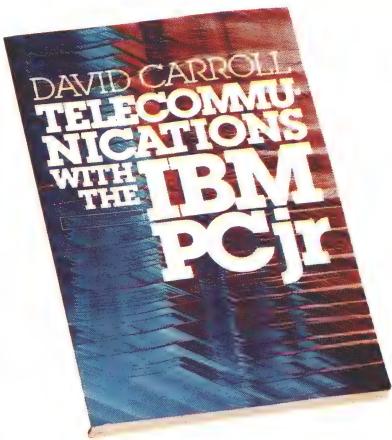
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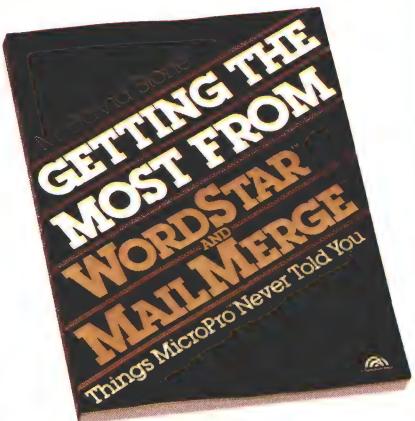
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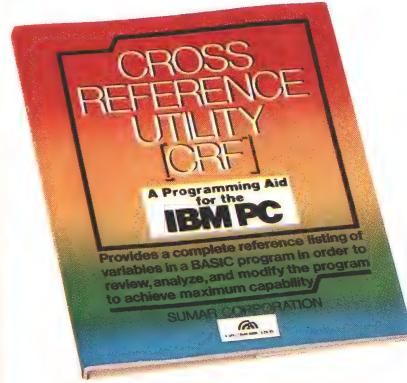
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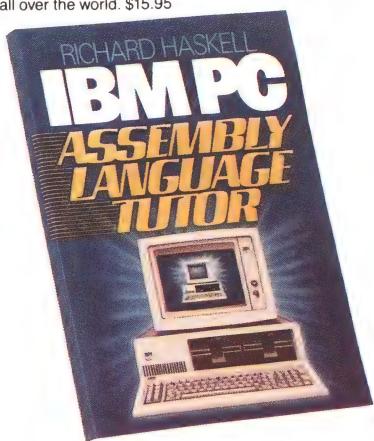
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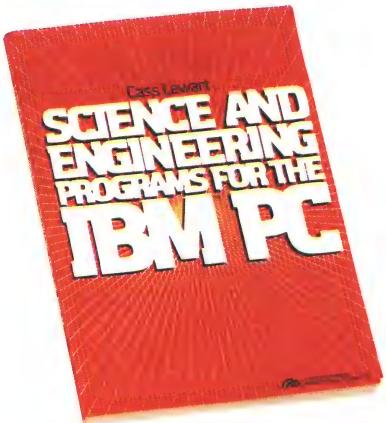
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60-Second Slides

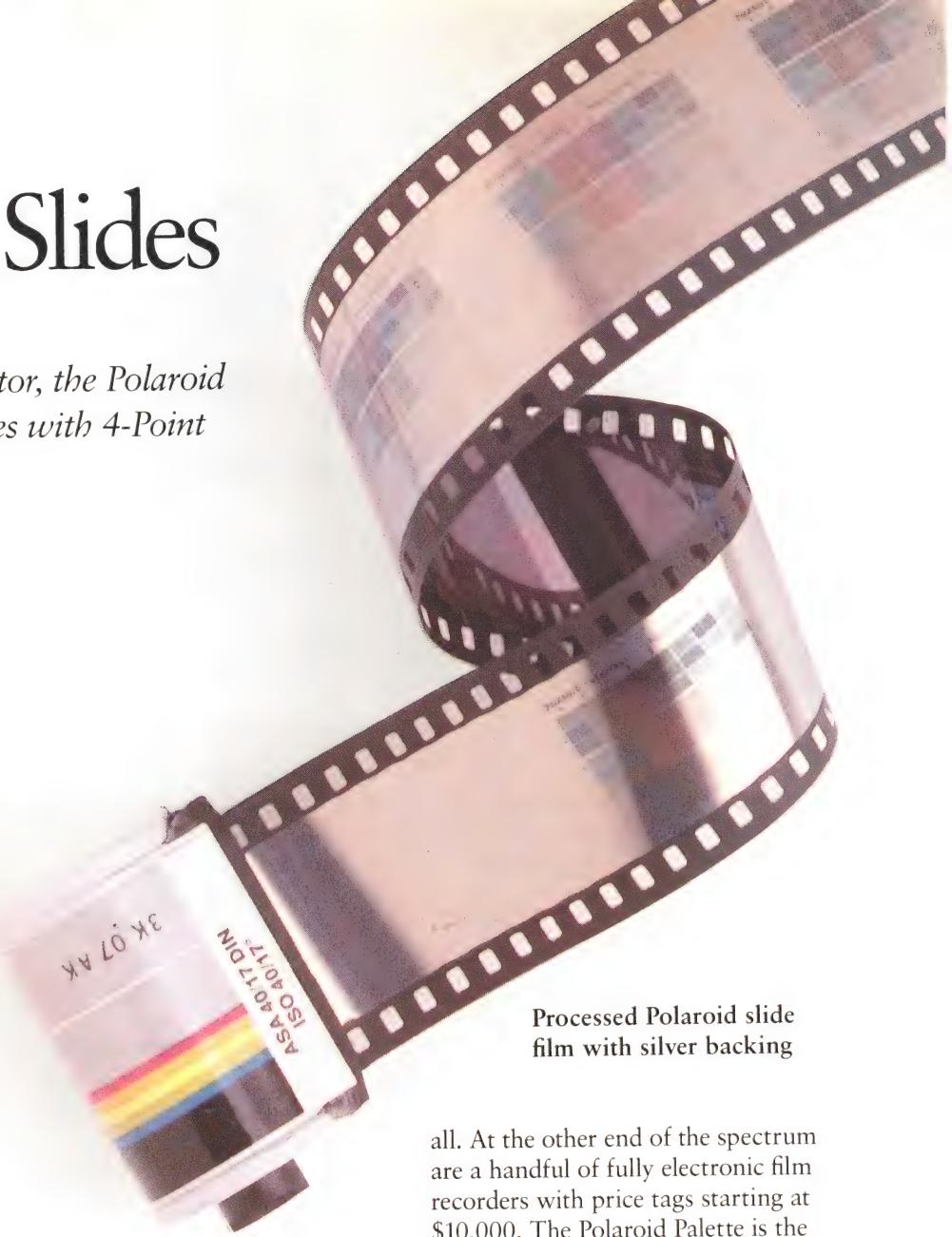
Polaroid's instant slide generator, the Polaroid Palette, is run through its paces with 4-Point Graphics and Graphwriter.

Cindy Hamburger

The Polaroid people have long been the undisputed leaders in the field of instant pictures. They had the foresight to invest in the genius of Dr. Edwin H. Land, the inventor of the 60-second Land camera, back in 1948. Within eight years over 1 million Polaroid Land cameras had been manufactured and distributed throughout the world.

Polaroid has continued to dominate the instant camera market they created and to introduce innovation after innovation. Now Polaroid has introduced its formula for immediate gratification into the computer marketplace with the Polaroid Palette, a desktop camera that shoots CRT (cathode ray tube) screens and creates color slides and prints in 60 seconds.

The purpose of the Palette is to generate hard-copy computer graphics with a variety of media and devices, including color slides, instant prints, computer printers, and graphics plotters. With the Palette, businesspeople can quickly create slides captured from graphics software, and artists can photograph their own creations from graphics packages designed to create free-form art.



Processed Polaroid slide film with silver backing

In the variety of computer slide generators currently on the market, this camera stands alone in sophistication. The simplest and most inexpensive slide generator, the Instagraphic, is manufactured by Polaroid's arch rival, Eastman Kodak. The Instagraphic combines a light-shielding rubber hood with a detachable Kodak instant camera. The VideoSlide 35, manufactured by Lang Systems (see "Screen Shots," PCW, Vol. 1, No. 5) is still the easiest and most reliable screen camera of

all. At the other end of the spectrum are a handful of fully electronic film recorders with price tags starting at \$10,000. The Polaroid Palette is the only camera that combines software with a full exposure and developing system.

Cameras, Cables, and Challenges
The main component of the Polaroid Palette is the 12 $\frac{3}{4}$ - by 7 $\frac{3}{4}$ -inch recorder (exposure unit). The recorder consists of a black-and-white monitor and a red, blue, and green color wheel. The package also includes two cameras that attach to the front of



the recorder, a 35 millimeter (mm) Minolta camera that comes with a slide film processor, and a 3½- by 4¼-inch Polaroid Land camera for shooting instant pictures.

The Palette package includes a number of components for shooting, developing, and mounting prints and slides, and all the necessary cables to tie the parts together (RS-232C, video I/O, camera synchronization, and power cord). A serial port and a color graphics board are required, but you don't need a color graphics monitor.

The cameras are adaptations of the commercial versions of the Minolta and Land cameras. The 35mm motor-driven Minolta accepts standard lenses, although the lenses are not included in the purchase price. The Minolta and Polaroid Land cameras are not completely compatible with the PC, because Polaroid tried to cut costs by using the same optical configurations for both. This setup causes the displayed image to be both reversed and upside down when seen with the Polaroid Land camera. In addition, since the Palette is capable

of producing more colors than the monitor can display, changes to the color palette are never reflected on the monitor. In other words, what you see is not what you get.

The Palette's documentation is done in typical Polaroid plastic-coated, glossy rag. It is attractive, ac-

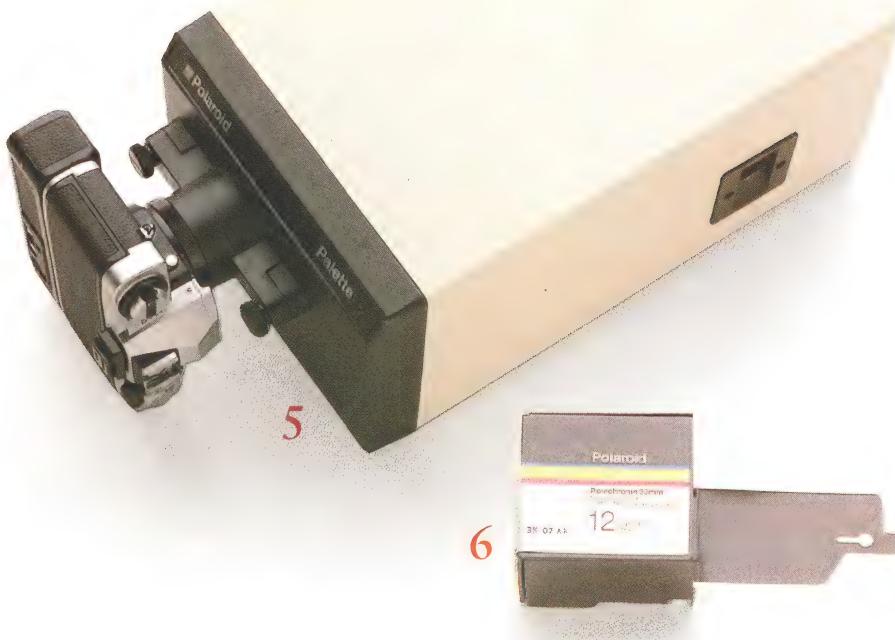
Fortunately, Polaroid knows how to use its patent on immediate gratification.

curate, and informative. With a little added grease it could pass for a car mechanic's manual, and it should be used in the same way. Even computer experts will constantly need to refer to the manual for operations such as loading the film, switching camera backs, and checking the motor drive batteries. Experienced photographers, even gadget-oriented types, will find the massive cabling between exposure unit, camera, and computer challenging.

The Polaroid Palette is packaged with two types of film: Polacolor Type 669 for instant prints and Polachrome 35mm film for slides. You can also configure the program to run with Ektachrome (ASA 64), Agfachrome (ASA 100), or Fujichrome (ASA 100).

The black-and-white CRT inside the recorder is flat, tending slightly toward the convex to correct any parallax distortion. The image you photograph is displayed on the screen and is colored during exposure, providing a higher-resolution image than that produced on a color monitor. The image is exposed to the film in three stages. The shutter of the camera remains open as the color wheel spins, exposing first the red, then the blue, then the green portions of the image, which are mixed during processing of the film.

Exposures are made directly from the recorder's monitor and not from your own monitor. The quality and



(1) Polaroid developing tank, (2) Slide mounter, (3) Land camera, (4) 72-color palette, (5) Exposure unit with Minolta camera, (6) Developing pod for processing film

aspect (the ratio of horizontal and vertical distances) of your monitor and of your color graphics board, therefore, will not affect the quality of the photographed image.

Installing the Software

The installation program for the Polaroid Palette is covered in the Setting Up and Tutorial sections of the manual. After you configure the Palette software (called the Palette Program) for the correct number of disk drives and the correct communications protocol, the manual gives instructions for photographing five test prints. This takes 2 to 3 tedious hours and a lot of trial and error. Once installed, however, the software is completely menu-driven and responds diligently without mishap or rudeness. The function keys take you back and forth between menus or return you to DOS.

The tutorial guides you through the 64 steps you will be called upon to repeat every time you want to take a picture. Fortunately, Polaroid knows how to use its patent on immediate gratification: you are rewarded for all your efforts with five perfectly developed prints and a fa-

miliarity with the keyboard operations necessary to run the software.

The first two exposures you make with the Palette Program are ColorKey and ColorSets. These are color tables to which you can refer when making exposures (see Figures 1 and 2). ColorKey shows the 72 colors available for recoloring images. To set exposure or to recolor a graphic image, you are required to select a combination of a color (from colors A through H) and a value (from values 1 through 9). It is better to consult this chart when selecting the exposure than to take a shot in the dark.

The ColorSets menu shows eight preselected color sets that can be substituted for an image's original colors. Sets 1 and 2 of this table are the same as the PC's palette "0" colors—red, green, and brown—and the PC's palette "1" colors—cyan, magenta, and white. The Palette Program expands the normal capabilities of the PC, permitting you to use eight different color sets of three or four colors each.

Using PSAVER

Polaroid currently claims that the Palette supports over a dozen graphics programs, including *Artist*, the PC-DOS version of *BPS Business Graphics*, *Chartman*, *Chart-Master*, *Energraphics*, *Fast Graphs*, *Graphmagic*, *1-2-3*, *Mirrorgraph*, *pfs:Graph*, *SignMaster*, and *Visitrend/Plot*. I tested the camera with *4-Point Graphics* by Imsi Software Publishers, a simple line-drawing program that is valuable for creating geometric shapes such as squares, circles, or parabolas. *4-Point Graphics* is not included in Polaroid's list, but I found no problems with compatibility.

4-Point Graphics has its own palette program, and colors can be manipulated on the screen before a photograph is taken. The color indicator bar on the status line is located on the top left side of the screen. If you want to change all greens to reds, for example, toggle the <F1> and <F2> keys until the color bar on the status line indicates the color green, then use the <F3> and <F4> keys to change the color bar to show red. Toggling the <F5> and <F6> keys lets you change the background col-

● Hands On

ors. To erase, paint over your errors with the background color. To save the color conversion, type A. To restore the picture to its original colors, press <Backspace>.

You can make additional color changes to a graphic created with separate graphics software by saving the graphic with Polaroid's PSAVER utility. Once you are satisfied with a screen created with a graphics program, save the file to disk, then load

In a minute and a half you can be holding a developed roll of slides.

the Palette Program and type PSAVER at the A> prompt. This loads PSAVER into memory. You then remove the Palette disk, reinsert the disk that contains the graphic, and bring the graphic to the screen. Press <Shift>-<PrtSc> to save the graphic in the correct format. You can now use the Polaroid Palette to manipulate the colors of the graphic.

The moment the thought of taking a picture crosses your mind, reach over and turn on the Polaroid recorder. The recorder takes 20 minutes to warm up, about the same length of time it takes to run through the software menu session. To photograph the image with the Palette, return to the main menu and press <F6> for a catalog of the images stored on the current disk. Once you have selected an image to photograph, press <F3> to load the file.

Images saved with the PSAVER command will have a file extension starting with .P, such as .P40. The file extension .PXY means that PSAVER was not able to determine the source of the image. If you try to load an

image that has a .PXY extension, you will be asked to specify an "image type classification." For example, if you're trying to load an image created with Lotus's 1-2-3, you would choose option 1 to indicate a medium-resolution, four-color graphic.

To take a picture of the selected image, press <F8> to get to the Exposure menu and press <F8> again to expose the current image.

Using the camera is simple. You make an exposure by pressing the <Space> bar. A motor drive attached to the base of the Minolta automatically advances the film when the exposure is complete. To shoot instant prints, you have to remove the dark slide on the Land camera first. However, the menus prompt you for this action as well as alert you with a tone when the exposure is complete. Processing of the slides is done in Polaroid's state-of-the-art instant slide film processor. In a minute and a half you can be holding a developed roll of slides. A slide-mounting machine and 25 mounts are included for framing finished slides.

Graphwriter

Not all graphics programs are compatible with the Palette Program or the PSAVER utility. For example, the *Koala Pad* was tested using the PSAVER command, and the result was a rendition of the image in black and white. The Palette Program is designed to record only IBM-standard, medium-resolution and high-resolution screen images. The program does not currently support the plethora of high-resolution graphics boards such as Plantronics' ColorPlus board.

One graphics program, *Graphwriter*, is highly compatible with the Palette because it incorporates the Palette's software. Graphic Communications bought the license to the

Palette Program and merged the program with a chart generator and an artist program. The most efficient way to use *Graphwriter* is to generate presentation graphics with *Graphwriter* and photograph them using the Polaroid recorder.

The special version of *Graphwriter* for use with the Polaroid recorder requires 256K of memory and comes with the UCSD p-System operating system. To anyone accustomed to working with DOS, installing a disk using the p-System feels like being lost in a jungle.

To begin work with *Graphwriter*, follow the instructions for creating and photographing a sample bar chart. Position the recorder between the system unit and the monitor, leaving ample air space between the units to prevent overheating or electrical interference. Try to avoid punching, abusing, or otherwise moving the Palette during operation; vibrations may cause your pictures to blur. Mixing cables and wires should also be avoided.

Once you have generated the graphic, return to the main menu and select Change Plot Options, then select the Options menu. For your first dry run you should probably rely on the defaults incorporated in the Options menu. Make as many exposures as necessary to get the correct mixture of color and text.

Graphwriter defaults to Polachrome slide film every time you create an image, so if you want to make prints, use the Options menu to change the film type. Whatever hardware you intend to use to produce output (printer, plotter, or Polaroid Palette), you should then go to the Style menu to change titles, text, or color.

If it is text that you want to capture, *Graphwriter* is the answer. There are 12 font types from which to choose. The program defaults to different font types depending on the

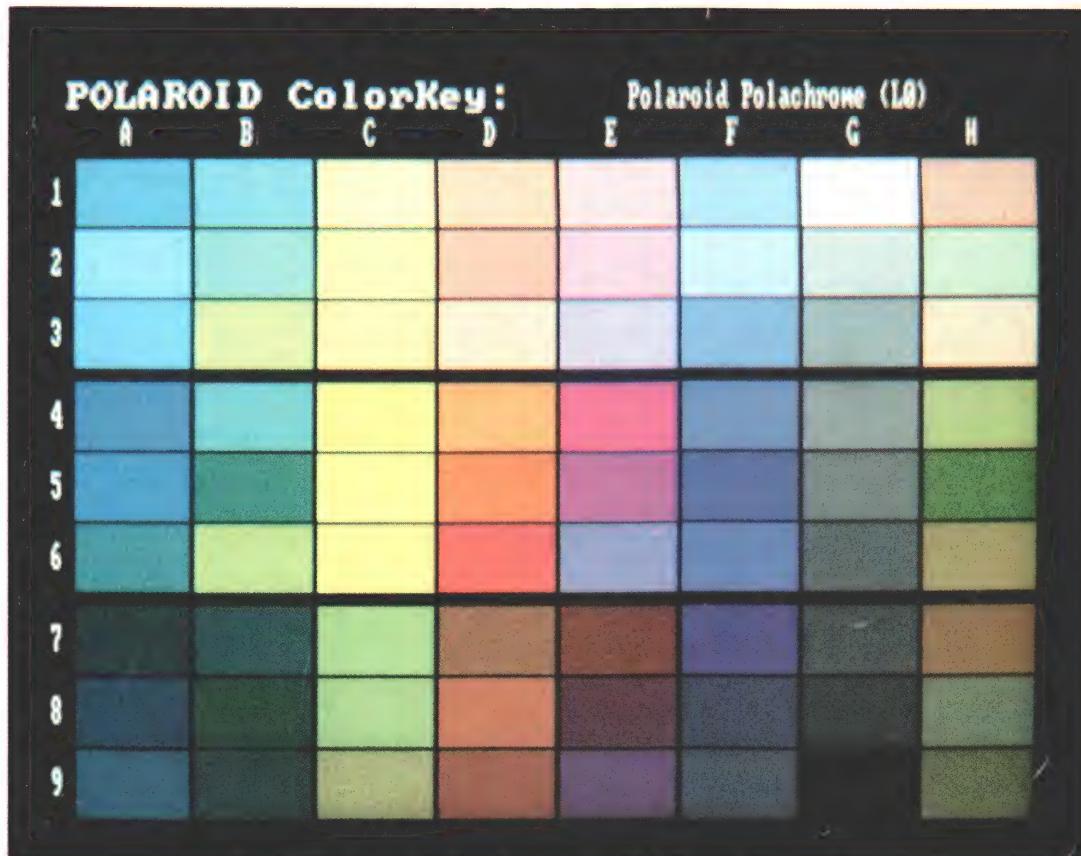


Figure 1:
The Polaroid
ColorKey

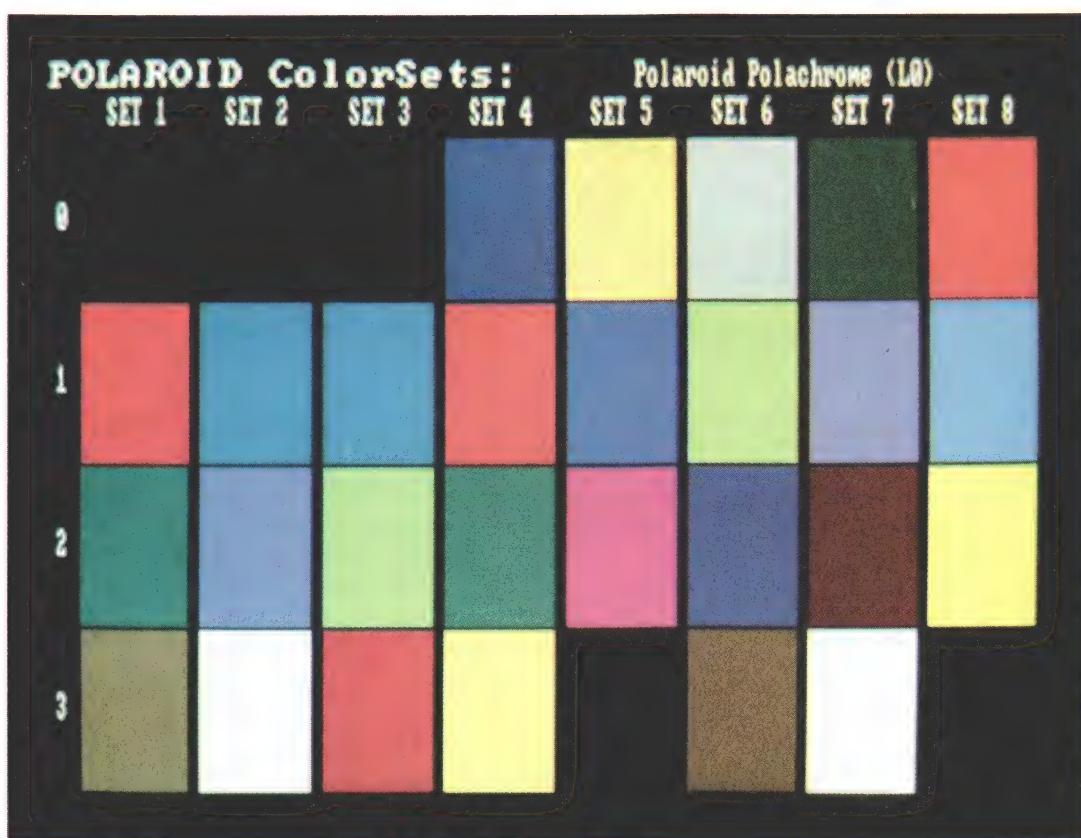


Figure 2:
The Polaroid
ColorSets

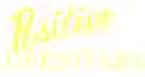
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graphics output device you are using. The text font for *Graphwriter* defaults to edge, which means that each text character is delineated with a 1-pixel outline of a color you choose. You can also choose font size. Text height can range from 1mm to 8mm (35 pixels).

Waiting for the compiler to translate an entire program again and again can lead to bad work habits (and coffee addiction).

Since color changes are indiscernible on your monitor, it often takes a test exposure to realize that you have chosen the wrong mixture of colors. The *Graphwriter* standard background color is Ice Blue (A2). Background colors should be different from any other chart element. Black (G9) is a good choice. You can designate 12 colors to a bar or use one of the eight color sets. Color set 8, "Exotic," combines Tangerine (C6) with Liz Taylor (E6) to create a bright magenta. For a low-key, relaxing graphics show, choose color set 2, "Pastels."

One of *Graphwriter*'s unique features is that you can change any of the preset style characteristics. If you think, for instance, that texturing a slice of a pie chart would enhance its message, you can do that. You can

also highlight or underline a block of text and add a bullet or a footnote. Pies can be rotated, bars expanded, and legends relocated. The possibilities are almost infinite.

One of the pitfalls of *Graphwriter* is that it is written in compiled Pascal. Programs such as the one you generate to produce a piece of graphic art must be translated into machine language before you can view the image. With *Graphwriter* this process takes a minimum of 5 minutes. Granted, we are all in need of an occasional 5-minute break, but the process becomes tedious when after every little change you make to your program (such as changing a background color), the program must be recompiled. Waiting for the compiler to translate an entire program again and again can lead to bad work habits (and coffee addiction). The manufacturers are considering the release of an MS-DOS version of *Graphwriter*, which will eliminate this problem and minimize the inevitable terminal ennui suffered while waiting for this program to finally click the shutter.

The Polaroid Palette is not as fast as the regular instant Land camera. Using the Palette, like using most new pieces of photographic equipment, takes a little ambition and a lot of getting used to. If you're still looking for something simple in a graphics camera, an inexpensive alternative remains: a darkened room, a vintage Nikon, and you, the human, in complete control. ■

Cindy Hamburger is the Editorial Manager of PC World.

Polaroid Palette
Polaroid Corporation
575 Technology Square 2M
Cambridge, MA 02139
800/225-1618
List price: \$1499
Requirements: 128K, serial port,
color graphics board with composite output

Graphwriter 3.2
Graphic Communications, Inc.
200 Fifth Ave.
Waltham, MA 02254
617/890-8778
List price: \$595
Requirements: 128K, serial port,
color graphics board

4-Point Graphics 1.0
Imsi Software Publishers
633 Fifth Ave.
San Rafael, CA 94901
415/454-7101
List price: \$195
Requirements: 128K, color graphics
board

VideoSlide 35
Lang Systems, Inc.
1010 O'Brien Dr.
Menlo Park, CA 94025
415/328-5555
List price: \$3099
Requirements: serial port, color
graphics board, color monitor

Eastman Kodak Co.
*Motion Picture and Audio-Visual
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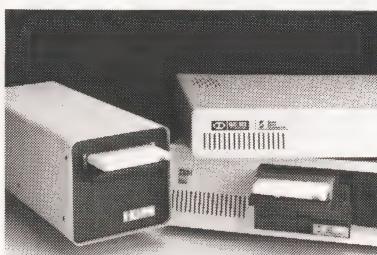
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1-2-3 Graphics Made Easy

If you don't know 1-2-3's graphics capabilities, you don't know 1-2-3. Here's a graphics tutorial to introduce you.

Joseph P. Celentano

The Lotus 1-2-3 graphics package is a powerful tool—and easy to use once you have struggled through a few applications. This tutorial will take you through the steps needed to create, view, and print a simple bar chart—one of several types of graphs 1-2-3 is capable of producing. (1-2-3 can also create stacked bar, line, X/Y, and pie graphs.) The graph you will create is based on sales figures for a hypothetical company called Systems Design Consultants (SDC). This exercise should acquaint you with enough of 1-2-3's graph functions to allow you to create graphs of your own.

This tutorial assumes that you are familiar with the overall 1-2-3 command structure and that you know how to move around a worksheet. The terms listed in *italics* represent 1-2-3 commands that you perform. They can be entered easily by typing the first letter of each command word, or you can use the pointer to select the appropriate command. Material in monofont represents text and values to be entered into cells or in response to prompts. To use 1-2-3's graph function as described in this article, you must have version 1A of 1-2-3, and your PC must be equipped with a graphics board, 192K of RAM, and a graphics printer.

Building the Worksheet

Before you can create a graph, you must construct a worksheet containing the data to be graphed. Start with a clean worksheet (if necessary, give the command /Worksheet Erase Yes) and create a worksheet identical to the one in Figure 1. In cell C2 enter

1-2-3 can graph up to six sets of data at once.

the label ^SDC CORPORATION SALES RECORD. In cell C3 enter the label ^JAN 1, 1983 - JUN 30, 1983. (The caret is added before a label to center it.) Enter the column headings shown in the figure into columns A through F of row 5, again using the caret to center the headings in the cells. To underscore the headings and to mark the boundaries of the columns, enter a row of eight hyphens in cell A6, prefaced by a single quotation mark to indicate to 1-2-3 that the entry is a label and not a mathematical operator. Use the command /Copy <Enter> B6..F6 <Enter> to copy the row of hyphens into each column in the row.

Enter the sample data shown in Figure 1 into columns A through F. In column G enter the month labels

for each row, centering them with carets. Once the worksheet is complete, save the file to disk under the name SALESREC by giving the command /File Save SALESREC <Enter>. You are now ready to create a graph of this information.

Creating and Viewing the Graph

The worksheet that has been created should remain on the screen after you save it. To access the functions that graph the data in the worksheet, give the command /Graph. The Graph main menu is displayed in the control panel. From this menu you can assign attributes, or "settings," to the graph. After each setting is made, this menu will be displayed again.

To tell 1-2-3 that you want to create a bar graph, give the command Type Bar. The next item in the Graph menu, X, allows you to specify labels for the X-axis (horizontal axis) of the graph. For the SDC graph we'll use the month names in column G of the worksheet. To specify this range of information, give the command X G7..G12. (An alternative method of specifying ranges in 1-2-3 is to position the pointer at the first cell in the range that you want to specify, anchor the location by pressing the period key, and move the pointer to the last cell in the range. When the area

● Hands On

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5	NY	S F	BOSTON	LA	PHIL	ATL		
6	-----	-----	-----	-----	-----	-----		
7	10000	14000	7000	18000	6000	11000	JAN	
8	11000	13000	9000	14000	9000	8000	FEB	
9	16000	11000	12000	13000	10000	9000	MAR	
10	17000	12000	13000	10000	13000	11000	APR	
11	18000	14000	12000	7000	13000	12000	MAY	
12	21000	16000	16000	11000	12000	15000	JUN	
13								
14								
15								
16								
17								
18								
19								
20								

Figure 1: The SDC worksheet

you want to specify is entirely highlighted, press <Enter>.) After you specify the range, the Graph main menu will be displayed again.

1-2-3 can graph up to six sets of data at once; you need only specify the range in the worksheet that contains each set of data, or the "data range." In this graph the sales figures for each city will be a separate data range. The items A through F in the Graph main menu allow you to specify what information will be used for data ranges A through F. To specify the data ranges give the commands

A A7..A12
B B7..B12
C C7..C12
D D7..D12
E E7..E12
F F7..F12

The last setting you must specify determines how the graph will be drawn, in color or in black and white; to do this you must use the Options command in the Graph main menu. If you have a composite

or black-and-white graphics monitor, select *Options B&W Quit*; for a color graphics monitor give the command *Options Color Quit*. The Quit command returns you to the Graph main menu.

Now that the attributes of the graph are defined, you can view the results. In the Graph main menu select *View* to display the results (in the Ready mode you can press <F10>). A graph like the one shown in Figure 2 should be displayed.

Legends and Titles

The bar graph you have just created describes the data by month and sales volume only. With the Options menu you can flesh out the graph with legends, titles, and other descriptions. Press any key to return to the Graph main menu.

Each data range on the graph is shown by a unique cross-hatching (on a black-and-white monitor) or color (on a color monitor), but someone looking at the graph could not tell what each bar represents. To add this information, give the command

Options Legend A. A prompt appears in the control panel asking for the legend of the first data range (range A). Type NY. Identify each data range with its label on the worksheet (the name of the city for which it depicts sales) using the following commands:

Legend B SF <Enter>
Legend C BOSTON <Enter>
Legend D LA <Enter>
Legend E PHIL <Enter>
Legend F ATL <Enter>

The Legend command must be given each time, since 1-2-3 returns you to the Graph main menu after each command is given. Selecting *Quit View* displays the graph with the added legends, which appear beneath the graph border.

1-2-3 permits four types of titles. The First title is positioned at the top of the page outside of the graph's borders. The Second title is inserted just below the First. The X-Axis and Y-Axis titles are located next to the appropriate axes.

From the Graph main menu give the command *Options Titles First*. Systems Design Consultants <Enter>. Add the other titles with the following commands:

Titles Second Six-Month Sales History
<Enter>

Titles X-Axis Month <Enter>

Titles Y-Axis Dollars <Enter>

Then select *Quit* to return to the Graph main menu and *View* to display the graph with the titles you just added.

Scale Formats

For most graph types you can choose the scale in which the graph should be drawn. 1-2-3 will automatically choose a graph scale appropriate for the data. (We've used automatic scaling for the SDC graph in Figure 2.) But for special effects you can choose your own scale. For instance, to impress upon an audience of salespeople how much room there is for growth, you could set a much larger scale for the Y-axis, leaving the sales bars covering near the bottom of the graph.

For bar graphs only the Y-axis is numeric, so you will need to choose a scale for that axis only. The command *Options Scale* produces a menu with Y-Scale, X-Scale, and Skip options. (The Skip command tells 1-2-3 to graph every other data entry, such as A1, A3, A5, and A7.) To set the scale for the Y-axis, give the command *Y-Scale Manual Upper 60000* <Enter>. 1-2-3 will use 0 for the scale's lower limit unless another number is specified.

1-2-3 also allows you to choose from several formats for the data displayed in each axis of the graph. You can choose from Fixed Scientific, Currency, General, +/-, Percent, Date, and Text. The graph data is in sales dollars, so the format of the Y-axis scale should be set to show currency (\$). Since you've just set the scale for

the Y-axis, the control panel still displays the options for the Y-Scale. Select *Format Currency*. A prompt appears requesting the number of decimal places to display. (The default is 2.) Type 0 <Enter>. Then select *Quit* to return to the Graph main menu.

With the Options menu you can flesh out the graph with legends, titles, and other descriptions.

Use the *View* command to look at the completed graph with the bars scaled small enough to inspire the sales force. The displayed graph should be similar to the one in Figure 3. Then press any key to return to the Graph main menu.

Saving the Graph

To save the settings you have chosen, you must give the graph a name; in this case we'll use SDC. To name the graph, give the command *Name Create SDC* <Enter> from the Graph main menu. The graph is saved as part of the worksheet file (SALESREC.WKS). Anytime you want to view the graph, you can call up the worksheet file and press <F10>. You can save several different graphs based on the same data in the worksheet file by giving each graph a different name. For instance, you could also store a pie chart based on the sales figures you've typed in the worksheet.

The building of the worksheet and the creating of the graph are now complete. Since the graph is named, it will always exist in the worksheet file. To manipulate or view the graph at

any time after you have named it with the *Name Create* command, you must give the *Name Use* command from the Graph main menu to make the graph "current." Once the graph is current, you can change the graph type, the data ranges, the legends, and the other settings.

Before you go any further, you should save the worksheet file that contains the graph. To do this, return to the main menu (with the command *Quit*) and then use the command */File Save SALESREC* <Enter> *Replace*.

Printing the Graph

Although a graph can be viewed and manipulated in a worksheet file, it cannot be printed. To print it you must save it in a graph file (to which 1-2-3 automatically assigns the file extension .PIC). Since the graph was just saved with the worksheet, you must recall it again, or make it "current." To do this from the Graph main menu, give the command *Name Use SDC* <Enter>. After you give the command, the Graph main menu will be displayed again.

To save the graph in a "picture" file, give the command *Save SDC* <Enter> from the Graph main menu; this creates the graph file SDC.PIC on the disk. To print the graph, you will access this new file. Leave 1-2-3 and start up the 1-2-3 PrintGraph program. Give the command *Quit* *Yes*. The screen displays the Lotus Access System. If you are working with floppy disk drives, you must insert the special PrintGraph disk in drive A: before you continue. Then select *PrintGraph* from the menu. The PrintGraph menu that appears lets you control several attributes of the graph, including options for the font, the position of the graph on the page, and the size of the printed graph.

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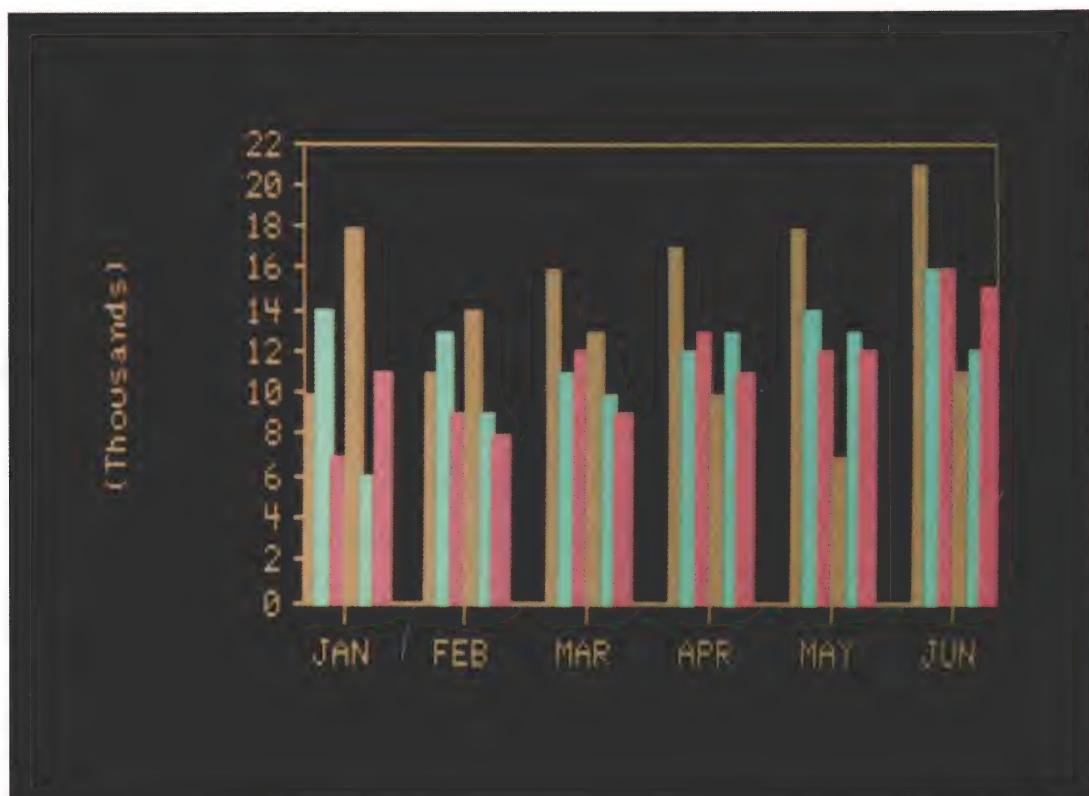


Figure 2: The SDC graph with preliminary settings assigned

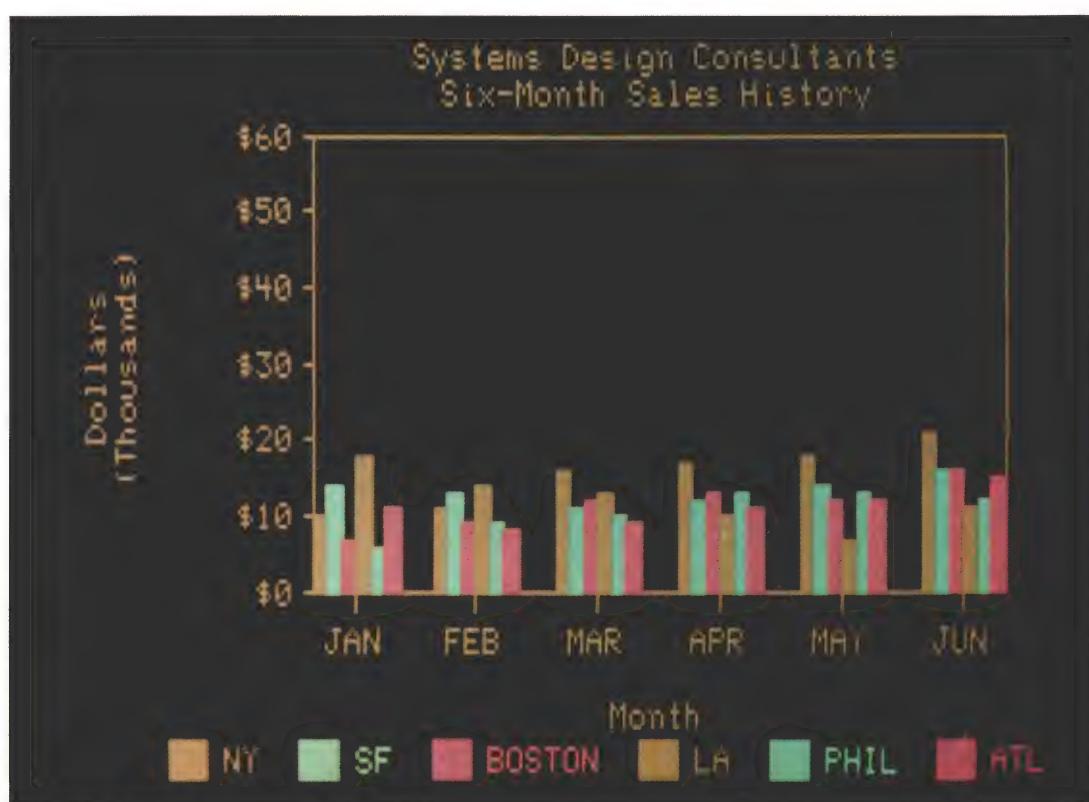


Figure 3: The finished graph

You can use two different fonts in a graph; the first is used for the first graph title, and the second is used for the rest of the graph. (If you do not choose a second font, the first font you select will be used for the entire graph.) Specify the first typeface you want by using the command *Options Font 1*. The screen displays a list of the type styles available for the graph. The names of the fonts are followed by a 1 or a 2. A 1 following the font name means that the font is the regular (light) face of that type style. A 2 following the name means that the option is the boldface version of the font. Select the font you want by using the <Space> bar or the cursor control keys to highlight your choice, and then press <Enter>. To select the second font, give the command *Font 2* and select from the menu in the same way.

After you select the fonts, the control panel returns to the Options menu. (Notice that the status screen, below the Options menu, is updated to show your new selections.) From the Options menu select the graph size with the command *Size Full*. This tells the program to size the graph for a full sheet of 8½- by 11-inch paper. Selecting Half would print the graph on half of an 8½- by 11-inch page. The Manual command allows you to choose your own values for the length and width of the graph, the size of the graph's margins, and the rotation of the graph on the page. After you specify the graph size, return to the PrintGraph main menu by giving the command *Quit Quit*.

Ready to Print

Unless your hardware conforms to the default specifications in PrintGraph, you will need to set the drive, device, interface, and page size options with the Configure command.

PrintGraph assumes that you are using an Epson FX-80/1 printer, that the picture file is in drive B:, that the Font file (on the PrintGraph disk) is in drive A:, and that you want to print on 8- by 11-inch paper (the Epson's default).

If the graph file is not in drive B:, you must specify its drive location by using the *Configure Files Pictures* command. When you are prompted to do so, enter the name of the drive

To save the settings
you have chosen, you
must give the graph a
name.

that contains the picture file. Then give the *Quit* command. These commands tell the program that the picture file (graph) is in the disk drive you specify, and then they return you to the Configure menu.

To tell the program what kind of printer you are using, give the *Device* command. A list of printers and plotters that the program supports will be displayed. Use the <Space> bar or cursor control keys to move the pointer to the desired printer and press <Enter>. Back at the Configure menu, select *Interface* and indicate the computer port to which the printer is attached. After you have selected the interface, the program returns to the Configure menu.

The other two items in the menu, Save and Reset, are used later to save and change new configurations. Return to the PrintGraph main menu using *Quit* and then give the *Select* command. A menu displays the name of the graph and gives directions for selecting that graph for printing. With the graph name (SDC.PIC) highlighted, press <Enter>. You will be returned to the PrintGraph menu.

You are now ready to print the graph. Turn on your printer and select *Go* from the PrintGraph menu, and printing will start.

Variations

This article gives only one example of 1-2-3's graphics capabilities, but once you learn the basic process of defining settings for the graphs and using the PrintGraph options, you should be able to use 1-2-3's other graphics features. To make a pie chart or a stacked bar graph, you use many of the same commands that you used to create this sample bar chart.

Once you have created and named a graph, you can visually explore the ramifications of changes in the underlying data. After you revise the worksheet, the <F10> Graph command will quickly display the graph based on the new data, using the settings you've already chosen. You can also experiment with different ways of presenting the same data—to determine, for instance, whether a pie chart gives a clearer picture than a stacked bar graph or whether an effect you want can be achieved by lengthening a scale or using different data ranges. Your reports will never be the same. ●

Joseph P. Celentano is a 1-2-3 instructor and applications specialist for Bechtel Power Corporation in San Francisco.

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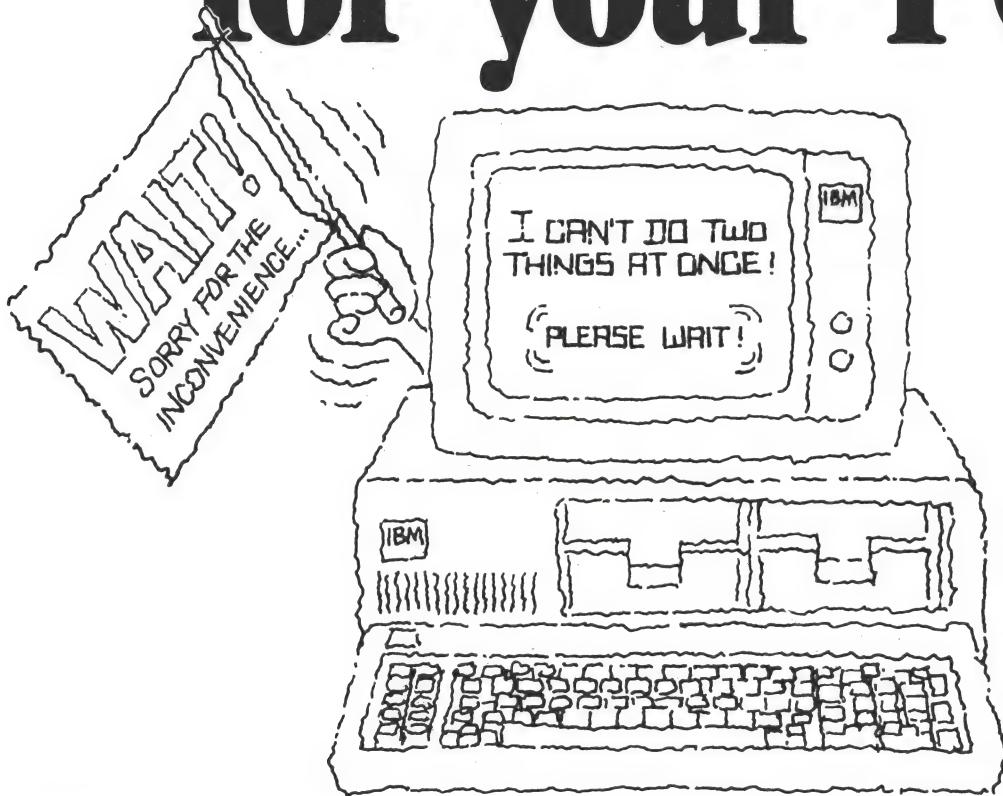
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Edited by Steven Cook

Christopher Wiley of Prescott, Arizona, advises that the BLANK.COM program for the Compaq created by the published version of his program BLANKMKR.BAS (*.*, PCW, Vol. 2, No. 4) causes the screen of his PC to go blank automatically after 27 seconds of keyboard inactivity rather than after 5 minutes. To modify the program for the PC, change the value of the checksum in line 170 to 12476 and change the third and fourth values in line 1050 to &H4A and &H15, respectively.

David Hohnadel of Cincinnati, Ohio, writes that replacement doors for Tandon disk drives are available from IBM; call 317/658-2022. The part number is 8654242, and doors cost \$3.95 each. The door pin is part number 8654262 and is priced at \$2.60. You can also get the parts at any IBM Service Exchange for an additional \$5 handling charge.

This month's column includes instructions for using DEBUG to assemble small programs, routines for controlling the <CapsLock> and <NumLock> keys from within batch files, and hints for keeping track of subroutines in BASIC and for making the function keys more functional. Finally, we have a fascinating program that reassigns the functions of the PC keyboard to a new and more efficient pattern.

Built-In Assembler

I found Richard Steck's article "Trouble in PC CTTY" [PCW, Vol. 1, No. 6] quite useful, but it seemed like a lot of overhead to use the BASIC interpreter just to output a few bytes to control the RTS and DTR signals. Until recently that was the only method available to PC owners who

didn't have an assembler. But since the release of DOS 2.00, the DEBUG command accepts assembly language statements and assembles them directly into memory. The process sounds more complicated than it actually is, and I encourage readers to

**Since the release of
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command accepts
assembly language
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bles them directly into
memory.**

experiment with this facility if they are curious about assembly language programming.

The statements shown in CTTYFIX (see listing) illustrate the steps needed to create a program called CTTYFIX.COM to replace Mr. Steck's program CTTYFIX.BAS. Place a disk containing a copy of the DOS 2.00 version of DEBUG.COM into drive A: and type DEBUG; the DEBUG program will display a hyphen as its prompt. Type the command A 100 to indicate that you want to assemble statements into memory beginning at hexadecimal address 100, the address where all .COM programs must begin.

DEBUG will respond to the Assemble command (A) by printing the address of the active segment followed by a colon and the current offset (100); it will then wait for you to enter an assembly language statement. (The segment number will vary depending on the configuration of your PC.) DEBUG automatically increments the offset as it assembles each line and then waits for another statement. When you are finished, press <Enter> without typing anything else, and DEBUG will return to its command mode.

After the statements have been entered, you can save them on disk. First use DEBUG's Register command to set the CX and BX registers to reflect the number of bytes to be written to disk. The BX register must be set to zero for any program less than 64K long. Set the CX register to 100 (hex) less than the last offset value (the one displayed on the line when you pressed only <Enter>). In this example the last offset was 011A, so the program length is 1A bytes.

To set the BX register to zero, type R BX and then press <Enter>. DEBUG will display a colon and allow you to enter a new value for the BX register. Type a zero and then press <Enter>. Use the same procedure to set the value of the CX register: type R CX, press <Enter>; and then type 1A <Enter> after the colon.

If you have any doubts about the length of a program, you can use DEBUG's hex calculator by typing the letter H at the hyphen prompt, followed by the last offset value, followed by 100. DEBUG responds with two values that are, respectively, the sum and the difference of the two values you typed after the letter H. The difference value is the length of your program.

```

A>DEBUG <Enter>
-A 100 <Enter>
3A35:0100 MOV AL,0B <Enter>
3A35:0102 MOV DX,03F9 <Enter> ;use 2F9 for COM2:
3A35:0105 OUT DX,AL <Enter>
3A35:0106 MOV AL,1A <Enter>
3A35:0108 MOV DX,03FB <Enter> ;use 2FB for COM2:
3A35:010B OUT DX,AL <Enter>
3A35:010C MOV AL,0B <Enter>
3A35:010E MOV DX,03FC <Enter> ;use 2FC for COM2:
3A35:0111 OUT DX,AL <Enter>
3A35:0112 MOV AL,F0 <Enter>
3A35:0114 MOV DX,03FE <Enter> ;use 2FE for COM2:
3A35:0117 OUT DX,AL <Enter>
3A35:0118 INT 20 <Enter>
3A35:011A <Enter>
-R BX <Enter>
BX 0000
:0 <Enter>
-R CX <Enter>
CX 0000
:1A <Enter>
-N A:CTTYFIX.COM <Enter>
-W <Enter>
Writing 001A bytes
-Q <Enter>
A>

```

CTTYFIX

Use DEBUG's Name command to assign a file name to the program. After the hyphen prompt, type the letter N followed by the file name—for example, N A:CTTYFIX.COM. Once a file name has been assigned, you must use the Write command to store the program on a disk. Simply type the letter W and press <Enter>. In this example, DEBUG will respond with the message 'Writing 001A bytes'; when it has finished, it will return to its command mode. To exit DEBUG, type the letter Q and press <Enter>.

I find that using DEBUG to create small programs is actually easier and faster than using the IBM Macro Assembler, and anyone who has DOS 2.00 can use this technique to "hand compile" BASIC programs that simply POKE values into memory. The commonly used statements translate as follows: 'DEF SEG = &Hxxxx' becomes 'MOV DS,xxxx'; 'POKE &Hxxxx,&Hyy' becomes 'MOV BYTE [xxxx],yy'; 'SYSTEM' becomes 'INT 20'.

Roland Hutchinson
Stanford, California

Editor's note: Use the technique described by Mr. Hutchinson to enter the programs in the following item.

Keyboard Control

The two programs CAPSLOCK.COM and NUMLOCK.COM in Figure 1 enable you to turn on the <CapsLock> and <NumLock> keys within a batch file prior to executing another program such as dBASE II or SuperCalc.

Jim Anes
Brantford, Ontario

Editor's note: The programs CAPSOFF.COM and NUMOFF.COM are the logical inverse of these programs and will turn off the <CapsLock> and <NumLock> keys.

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CAPSLOCK.COM

```
MOV DX,0040
MOV DS,DX
MOV AL,[0017]
OR AL,40
MOV [0017],AL
INT 20
```

NUMLOCK.COM

```
MOV DX,0040
MOV DS,DX
MOV AL,[0017]
OR AL,20
MOV [0017],AL
INT 20
```

CAPSOFF.COM

```
MOV DX,0040
MOV DS,DX
MOV AL,[0017]
AND AL,BF
MOV [0017],AL
INT 20
```

NUMOFF.COM

```
MOV DX,0040
MOV DS,DX
MOV AL,[0017]
OR AL,DF
MOV [0017],AL
INT 20
```

Figure 1: Assembly language programs to control the <NumLock> and <CapsLock> keys from DOS

Subroutine Locator

Locating a particular subroutine within a large BASIC program can be difficult because the BASIC editor does not have a search capability. I create a subroutine index in my programs by adding two lines similar to those shown in SUBFIND (see listing).

```

10 REM Example program
20 ON 0 GOSUB 740, 890, 1240, 1380, 1720, 1940
30 REM      Input, Help, OpenFile, ReadFile, Error, Initialize

```

SUBFIND

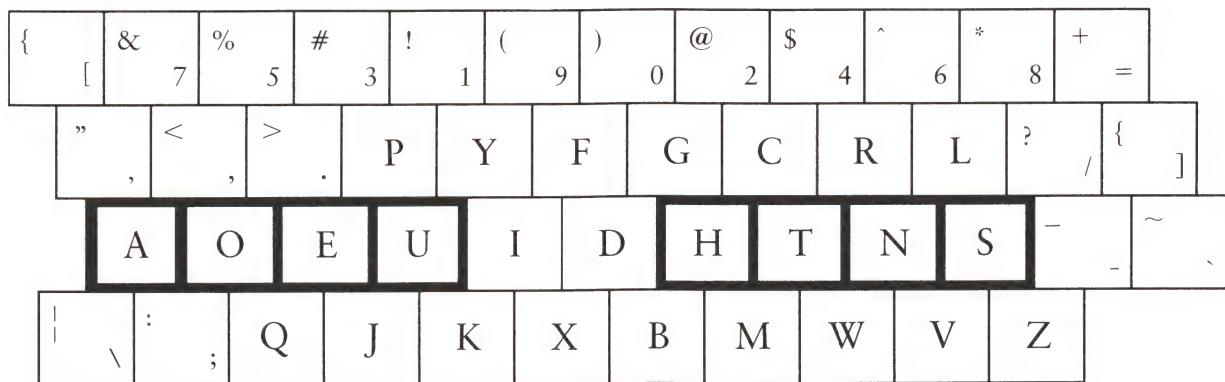


Figure 2: Dvorak keyboard layout

Because there is a zero as the argument for the ON...GOSUB statement, no subroutine will be called, and execution falls through to the next statement. Therefore, line 20 has no effect on the execution of the program. However, when the program is renumbered, the line numbers in the ON...GOSUB statement will be updated to reflect the new locations of the subroutines.

*David E. Lupo
Moncks Corner, South Carolina*

Editor's note: You may need several such lines to identify all of the subroutines in a large program.

Self-Cleaning Keys

Have you ever pressed the <F1> key to list a program only to get a 'Syntax Error' message because there were extraneous characters on the line? To prevent that problem, I redefine the function keys with an Escape character preceding the command—for example, 10 KEY 1,CHR\$(27)+"LIST ". The Escape clears the line before the rest of the command is issued.

*Jerry Hartis
Knoxville, Tennessee*

Editor's note: Definitions for all ten function keys can be placed into a small program that terminates with a NEW command and can be run automatically by a batch file whenever you start BASIC.

Build a Better Keyboard

When the typewriter was developed, the keys were positioned to slow down the typist, because the keys would jam if words were typed too quickly. This intentionally inefficient arrangement of keys is known as the "QWERTY" keyboard, and it appears on just about every keyboard used in the Western Hemisphere.



```

5 ' This program implements the Dvorak Simplified Keyboard
10 DEF SEG=0:FOR I=0 TO 3:V(I)=PEEK(I+88):NEXT      ' Save keyboard vector
20 DEF SEG=&HC00 : OFFSET=0 : GOTO 80                ' Initialization routine
30 DEF SEG=&HC00 : DVORAK=53 : CALL DVORAK          ' Switches to DSK
40 PRINT "Dvorak keyboard now activated. Type RUN 50 to deactivate.":END
50 DEF SEG=&HC00 : QWERTY=85 : CALL QWERTY          ' Restores QWERTY
60 PRINT "QWERTY keyboard has been restored.":END
70 '
80 CLS:PRINT "Dvorak keyboard installation in progress..."
90 ' First, POKE the program into memory
100 FOR I=1 TO 9
110   CK=0:READ LN
120   FOR J=1 TO 12
130     READ X$:X=VAL("&H"+X$):CK=CK+X:GOSUB 330
140   NEXT
150   READ CKSUM:IF CK<>CKSUM THEN 310
160 NEXT
170 ' Next, POKE the translation table in
180 FOR I=1 TO 8
190   CK=0:READ LN
200   READ A$
210   FOR J=1 TO LEN(A$)
220     X$=MID$(A$,J,1):X=ASC(X$)
230     IF X$="~" THEN X=34 'convert to quote marks
240     CK=CK+X:GOSUB 330
250   NEXT
260   READ CKSUM:IF CK<>CKSUM THEN 310
270 NEXT
280 ' Finally, save the old keyboard interrupt vector
290 FOR I=0 TO 3:X=V(I):GOSUB 330:NEXT
300 PRINT "Installation complete. Type RUN 30 to activate.":END
310 PRINT "Data Error in data line";LN:END
320 ' The actual POKEs are done here
330 POKE OFFSET,X:OFFSET=OFFSET+1:RETURN
340 ' These lines contain the program
350 DATA 1,CD,60,53,1E,BB,4C,C0,50,3C,20,72,13,1174
360 DATA 2,3C,7C,73,0F,80,FC,54,73,0D,80,FC,37,1341
370 DATA 3,74,05,80,FC,47,72,03,58,EB,10,31,C0,1269
380 DATA 4,8E,D8,A0,17,04,24,40,75,03,BB,A8,C0,1312
390 DATA 5,58,D7,1F,5B,CF,FA,50,1E,31,C0,8E,D8,1591
400 DATA 6,A3,58,00,B8,00,0C,A3,5A,00,A1,24,C1,1090
410 DATA 7,A3,80,01,A1,26,C1,A3,82,01,1F,58,FB,1348
420 DATA 8,CB,FA,50,1E,31,C0,8E,D8,A1,24,C1,A3,1715
430 DATA 9,58,00,A1,26,C1,A3,5A,00,1F,58,FB,CB,1306
440 ' This is the translation table
450 DATA 10,"{ %#!)-$^@+W8VZ6[75319",1407
460 DATA 11,"024sSw=vz&AXJE.UIDCHTNM",1752
470 DATA 12,"BRL'POYGK,QF:/\](*)`axje",1745
480 DATA 13,>uidchtnmbrl~poygk<qf:?",2226
490 DATA 14,"{ %#!)-$^@+w8vz6[75319",1503
500 DATA 15,"024SsW=VZ&AXJE>UIDCHTNM",1672
510 DATA 16,"BRL~POYGK<QF:/\](*)`axje",1755
520 DATA 17,".uidchtnmbrl'poygk,qf:?",2200

```

DVORAK.BAS

As time passed, the mechanics of typewriters were improved, but the QWERTY keyboard has remained the same. Dr. August Dvorak was so dissatisfied with the standard keyboard that he devised his own layout, called the Dvorak Simplified Keyboard (DSK, see Figure 2). The program shown in the listing DVORAK.BAS will convert the IBM PC's QWERTY keyboard to a DSK.

To use the program, type RUN to install the new keyboard routine in memory, then type RUN 30 to switch into Dvorak mode. The keyboard will be defined as a DSK. To return to QWERTY operation, type RUN 50—but remember, you must type that command using the DSK layout.

*Donald Gau
Houston, Texas*

Editor's note: The DSK program resides in memory beginning at location 0000:C000 and cannot be used outside of BASIC. Anyone who converts Mr. Gau's program for use outside of BASIC is encouraged to submit their work for publication in this column. (Hint: Use DOS calls to determine and redirect interrupt 16H and use interrupt 27H to reserve an area of memory in which the program can reside.)

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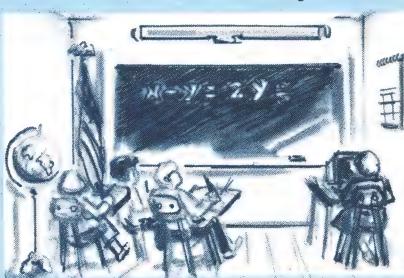
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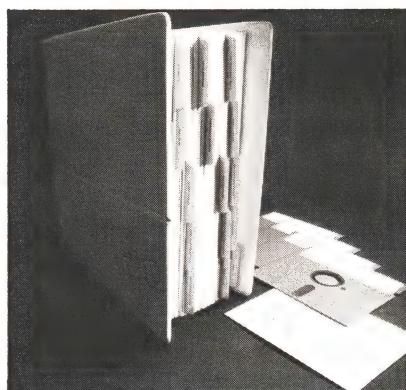
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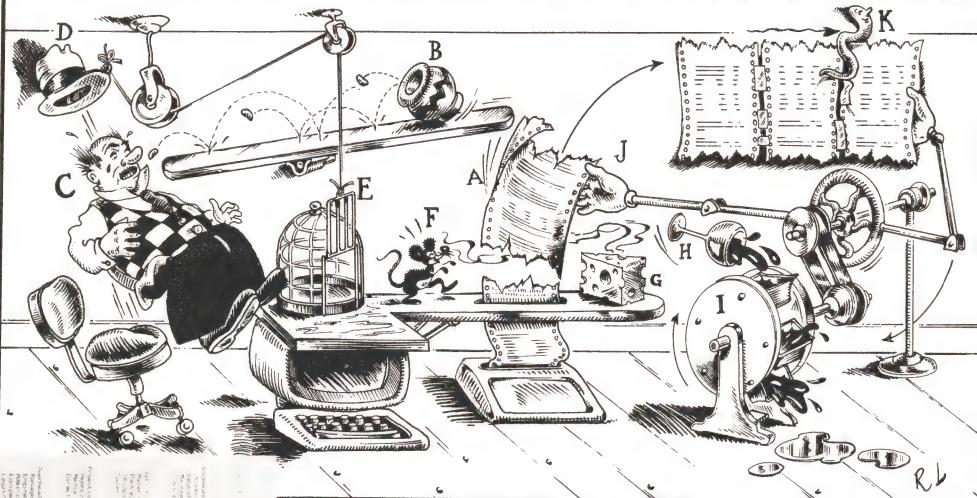
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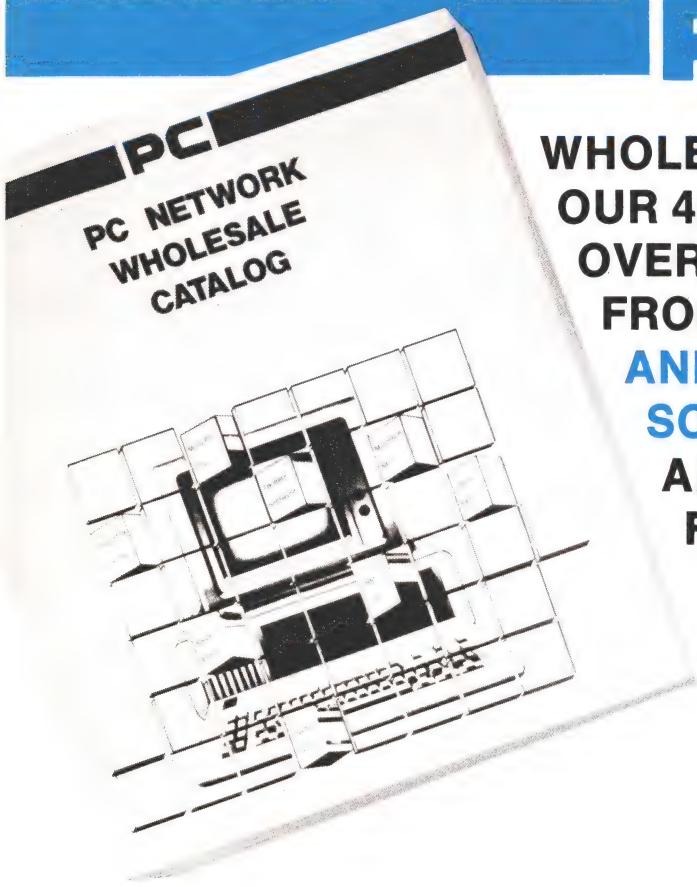
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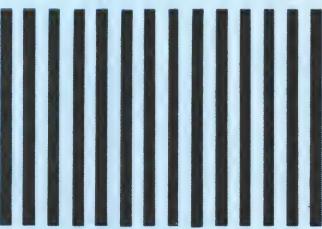
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Welcome to Campaign '84, the election in which the PC has come of age.

There's a new breed of campaign worker in politics this year. This tireless employee is dedicated to churning out hundreds of fund-raising letters, keeping tabs on scores of mailing lists, calculating budgets and salaries, complying with financial reporting requirements, managing schedules,

Coming a Long Way

In 1952, when one computer filled an entire room, a Univac correctly predicted the outcome of the presidential race. In the more than 30 years since, computers have shrunk, but their role in politics has grown enormously. Suddenly mainframes have company on the soapbox; small computers like the PC are grabbing an ever-increasing share of the work load.

Mainframe computers have traditionally handled large assignments for national campaigns. GOP fund-raising guru Richard Viguerie pioneered mainframe-based political mass mailings during the mid-1970s, and the Republican National Committee bought its own mainframe in 1975. Now, as the PC becomes entrenched as a campaign tool, it's helping to place less well-heeled challengers on a more equal footing with incumbents. Until very recently, only the big machines were capable





of performing the brutal clerical chores that once occupied scores of volunteers and bringing the organizational techniques of far larger campaigns to the thousands of state and local elections that take place every year.

At the presidential level the micro is used for its combination of computing power and mobility, an essential mixture during primary season. Walter Mondale's campaign staff added Kaypro computers to its entourage, while Gary Hart and John Glenn put IBM PCs to work in their bids for the White House.

Political strategists agree that lists are the organizational heart of every campaign. The lists represent people—contributors, volunteers, supporters, potential swing votes—who make the difference between triumph and defeat. These lists, once confined to index cards, are now grist for the PC's mill as campaigns translate scattered information into data bases via *dBASE II* and similar data management programs. Then, relying on word processing and mail-merge programs, this vital data becomes fuel for fund-raising appeals or issue-related mailings. Campaigns are also businesses, limited by time and place—and electronic spreadsheets are helping to manage the business side of politics.

The proliferation of PCs in political campaigns is motivating software developers. Even as campaigns adapt and refine such popular programs as *WordStar* and *1-2-3*, political consultants turned software developers are releasing packages that simplify the myriad chores of campaigning.

An Inauspicious Beginning

Winning a spot on the campaign team has not been easy for the personal computer. In 1982, when PCs were hitting the political trail for the first time and the personal computer industry was still in its infancy, there was good reason for skepticism about its political future. The experience of one Florida representative is instructive.

Bernie Friedman, administrative assistant to Florida Congressman Larry Smith, recalls that his boss was apprehensive about Friedman's idea of working a personal computer into Smith's campaign for the 16th district seat. Says Friedman, "His initial reaction was something like, 'What do we need that thing for?'"

At first Smith's intuition seemed correct. The Exxon 520 and accompanying software didn't perform as promised. When Friedman and his staff finally got the system to work, they discovered that the crude, excessively technical programs were over their heads. But just when things were beginning to look bleak, Smith's teenage son took the Exxon manual home. In a few days he and his

You Can Automate City Hall

Alexander Besher

In San Francisco, perhaps more than in most major urban centers, high technology has taken hold. The stevedores of yore have given way to systems analysts and other white-collar types who work in newly sprouted skyscrapers, blocks from abandoned piers.



Dianne Feinstein, the city's two-term mayor, has become an unofficial ambassador on behalf of Silicon Valley, which sprawls across former prune orchards 35 miles south of San Francisco. Silicon Valley is now a favored destination of visiting heads of state, including Queen Elizabeth of England and President François Mitterrand of

France. Mayor Feinstein has accepted with enthusiasm her role as informal host.

As the leader of a city on the "Pacific Rim"—the border of land on both sides of the Pacific that is the site of many emerging North American-East Asian economic partnerships—Mayor Feinstein is in a unique position to view how high technology overlaps international trade and how those matters, in turn, mesh with issues central to America's cities.

The scene on a recent spring morning was typical. The mayor welcomed a group of NEC (Nippon Electric Company) executives, headed by company Chairman Kobayashi. She presented Kobayashi with a key to the city in recognition of a computerized fingerprint identification system that

NEC manufactured for the San Francisco Police Department. The culmination of 12 years of R and D, the system is the second of its kind to be installed in the world. With NEC technology in place, the time needed for fingerprint searches can be compressed from months to minutes.

The mayor's microelectronic forays are not limited to acting as high-tech guide to the powerful and influential. Unlike so-called "Atari Democrats" Gary Hart and Jerry Brown, who advocate high technology as a means of revitalizing the American economy, Mayor Feinstein's reliance on technology is more prosaic, for small computers have definitely found a home at City Hall. For the business of running the city, Mayor Feinstein is a dedicated "Wang Democrat." When the Feinstein political campaign apparatus is in motion, she's an "IBM PC Democrat." Indeed, she achieved a resounding reelection last November abetted by a campaign staff versed in *dBASE II* on the PC.

Eric Jaye, spokesman for Clint Reilly Campaigns, the organization that managed Mayor Feinstein's 1983 reelection bid, says that the campaign relied on several PCs for a variety of chores, including managing lists, maintaining a data base of organizers, and conducting several mailings of 500 letters each. PCs have also assisted in the more mundane electoral tasks of billing, handling invoices, and keeping the books. "Computers have been essential in political life for seven or eight years," says Jaye, "but the PC is only now filtering into headquarters as a visible part of the campaign."

(continues)

friends had designed a system for the campaign. It was summer, and the kids gladly spent their days taking turns on the computer, churning out the letters needed to raise money for television commercials.

Everything was fine until school resumed. Then, with the primary coming up, the Smith campaign became desperate for technical—and in this case youthful—assistance. Friedman remembers a hectic September day when his staff had to retrieve the campaign's head hacker from class; he alone knew how to get the letters rolling. Enlisted again, the kids resumed spending free

hours at the headquarters. On one particularly frantic night a mother called, demanding that her child come home for dinner. Friedman refused to let him, knowing that the 16-year-old was the only one who could do the job. Although angered, the mother eventually relented and brought her son's dinner to the office.

You Can Automate City Hall (*continued*)

For a political consultant like Jaye and his staff, the PC means liberation from drudgery. And that can mean a leaner, more effective campaign. "Time is the number one constraint in politics," Jaye notes. "We've found personal computers to be extremely useful in doing things that were once done by hand. The PC lets us increase person-to-person campaigning, freeing volunteers to get out on the street." In the mayor's case the PC helped organize a volunteer corps of 2000—the largest such assemblage in the city's history, Jaye claims.

Jaye prefers standard PC software to programs packaged with politics in mind. "We didn't know anything about computers when we got our first PC, but we played with it and taught ourselves," he says. "We found *dBASE II* easy to learn. We're using a number of programs now." For Mayor Feinstein the proof of the PC's power is in the printouts—and at the polls.

PC World Chairman and Publisher David Bunnell recently spoke with Mayor Feinstein about personal computing and politics. The mayor's bright, spacious, ornately paneled City Hall office is festooned with San Francisco memorabilia. Large windows overlook the bustling Civic Center plaza. A bust of George Moscone, her late predecessor, stands in a corner by the window.

David Bunnell: PC World is examining how the proliferation of the personal computer may be changing, even opening up, the political process. How has microcomputing been a benefit to your campaigns?

Mayor Feinstein: I think that personal computing gives those of us in office the ability to have what we call a "house-sign" list—a volunteer list—of the sort that used to be kept on cards, until someone would invariably walk out with all the cards and we'd lose everything. Now it's all stored in computer memory. And data has become, on a mundane level, virtually theft-proof—although computer operations aren't invulnerable, of course.

I think that a sophisticated approach to microcomputing is important to San Francisco. This is, after all, a vital research and development center. The computer industry is and will continue to be a major job base for our people. Training people to become skilled in data entry, hardware design, and programming tasks—in short, all of those things that are integral to computer operations—really ensures a continuing supply of jobs for our youngsters. That's why we in San Francisco are increasing computer-related training in our elementary and secondary schools, vocational centers, and community colleges. We are predominantly a white-collar city, yet we need blue-collar jobs. The blue-collar jobs that accompany the industry's white-collar positions are critical for us.

Bunnell: Chairman Kobayashi of NEC was recently awarded a key to the city. Are you concerned about competition from the Japanese, and how do you see it affecting the development of the domestic computer industry?

Feinstein: I think that competition is healthy. Frankly, I think that what is not healthy is protecting against competition, because to do so is generally to admit to mediocrity. The Japanese have taken imitation and turned it into innovation. Mr. Kobayashi's company has been working for 12 years in cooperation with the National Police of

Presidential Programs

Although campaigns remain labor-intensive, PCs are enabling organizations to limit the drudgery and give staffers assignments that are meatier than letter writing and envelope stuffing. And in the heat of the campaign, necessity is breeding a lot of invention. Staff members are coming up with innovative ways of putting hardware and software to work.

Consider Colorado Senator Gary Hart's presidential campaign. The Hart bid took to personal computers out of financial need. Before the New Hampshire primary catapulted Hart to national prominence, his organization was starved for cash. Hart staffers devised a means of

acquiring computing power without a major investment; they prevailed upon supporters in key states to lease their PCs to the campaign at market value. PCs thus joined the Hart campaign for the duration to supply needed mailing and accounting assistance.

Back in Washington the Hart campaign used a Compaq to manage a potentially ticklish situation. Hart's New England victories brought extensive media coverage, and that meant chartered planes brimming with journalists. Since the Hart organization had no effi-

Japan to develop the fingerprint system. They spent time, made a commitment, and wanted to perfect the product. In my opinion, this is what we must do more of in America.

America's know-how is as good, if not better, than Japanese know-how. But I think that we sometimes take the consumer segment of our population for granted. We think that people are going to buy American even if it means that the product is more expensive. But people don't "buy American" by rote. Detroit learned this, and every industry in America is now learning this. The answer is to be competitive, to aim for the state of the art, and to aim for excellence and quality. Then people will respond.

Bunnell: What can you do to encourage these things?

Feinstein: Well, I try to speak out as much as I possibly can. I believe in free and open trade. I don't believe in tariff restrictions. I believe in exchange of information. We're entering the century of the Pacific. By the year 2010, according to estimates, 60 percent of the world's population will be living on both sides of the Pacific Ocean. This means that this ocean, which has been used as a barrier and as a theater of war, will become a vast telecommunications superhighway. The opportunity for Pacific Rim nations to become developed, to become a part of this expanding computerized world, is profound. San Francisco is the gateway to this activity, since we are the center of much of this trade and commerce. We view this as a very fortunate and essential role to play.

cient way to bill news agencies for costs incurred flying reporters around the country, the campaign was, according to Technical Operations Director Dave Masselli, "extending credit to CBS, ABC, and NBC" (hardly an idle concern considering that the candidate's high campaign costs led him to mortgage his house).

Using 1-2-3 on the Compaq, an accountant wrote a series of programs that enabled the campaign to bill newspapers and TV networks for current charges. This adjustment alone added \$18,000 to the Hart coffers. The campaign also used the Compaq for general billing and accounts receivable tasks.



● Community

John Glenn's abortive bid for the presidency similarly put 1-2-3 through its paces. Nine months into the Glenn campaign, a budget analyst suggested bringing in three PCs equipped with 1-2-3 so he could keep "control" of things. In addition to basic accounting and budgeting, the PCs helped with "follow-up." "When there was a particular event, we'd take down names, enter them into the PC, and later print out thank you letters," says office manager David Brant.

Hitting the Target

Launching a barrage of letters is only one part of running a campaign, of course. Applications ripe for the PC also include polling, targeting groups of voters, and complying with state and federal campaign financial reporting requirements. Campaigns are doing these jobs with off-the-shelf spreadsheet software, newly customized programs, and packages created expressly for office seekers.

Targeting. Targeting voters is a candidate's way of efficiently allocating time and energy by determining how demographics affect votes. The PC is helping campaigns compile histories of relevant past elections, from which strategists can attempt to predict voter behavior. This is accomplished by entering precinct data into a

Although the marriage of PCs and political campaigns was made in Washington, it's being nurtured this year at the grass roots level.

VisiCalc or 1-2-3 spreadsheet. Using the program's basic calculations, campaign officials can determine a given precinct's mix of Republicans and Democrats. Sophisticated targeting techniques examine precincts on such criteria as voter turnout, past voting trends, and the intensity of support for other candidates.

Polling. Although the marriage of PCs and political campaigns was made in Washington, it's being nurtured this year at the grass roots level. Polling is a case in point. Surveying the electorate has traditionally been too costly for local candidates. Equipped with the right software, however, the PC is automating—and making accessible—the polling process.

Once a campaign has selected an area that it wants to canvass, a polling program generates random telephone numbers that have the appropriate prefix. Cam-

paign officials refine the sample; volunteers then call the numbers and ask a series of multiple-choice questions.

The program analyzes poll results by culling similar responses to selected questions. This cross-tabulation is known as "identifying response groups" and helps candidates determine their standing among various constituencies. Although polling by PC isn't likely to replace Gallup or Harris, it is providing state and local candidates with quick, low-cost surveys.

Financial reporting. Furnishing state and federal authorities with current campaign finance data has evolved into a virtual cottage industry for political campaigns. *CRS: The Campaign Reporting System* from Poynor Computer Applications is one package aimed at satisfying those filing requirements. The program enables campaigns to provide periodic information on pledges, contributions received, loans received and made, and accrued expenses. Because the system keeps extensive records of all these elements, data can be prepared directly for campaign disclosure reports and used in day-to-day campaign management.

Software to Run With

While some campaigns enlist such workhorses as *WordStar*, *dBASE II*, and 1-2-3, others are choosing from an array of packages with a distinctly political slant.

Solon, from Q Systems Research Corporation, is among the most elaborate and expensive offerings. The manufacturer claims that *Solon* provides a complete PC-based political package: hardware, software, and political consulting by Thomas Dackow, the firm's president. *Solon*'s \$16,000 price tag buys a PC XT with 256K; a Hayes Smartmodem 1200; a Qume letter quality printer; a Ziyad sheet feeder; an IBM Graphics printer; Tecmar's Captain board with 384K RAM, clock, and serial and parallel ports; specially adapted versions of 1-2-3, E-COM, and IUS's *General Ledger* and *Accounts Payable* packages; and *Solon* proprietary software.

For campaigns that aren't that well-heeled, a number of political packages are available for less than \$1000, among them *Campaign Manager*, *Politech 1*, and *dCAMP*. The *Campaign Manager* story illustrates how politics and technology can converge. Undaunted by managing two failed congressional bids, brothers John and Dean Phillips—political strategists with programming expertise—devised a \$499 program that they claim can perform a number of campaign tasks. The Phillips brothers say that *Campaign Manager*, now marketed by Aristotle Industries, will monitor budgets and financial reports for state and federal agencies. It also contains modules designed to help campaigns handle advertising, press relations, scheduling, fund-raising, targeting, and

All in the Family



UPI

Jeff Carter and his father, former President Jimmy Carter, at COMDEX

Jeff Carter is no stranger to political life. As the son of former President Jimmy Carter, he grew up in the public eye, and he continues to work on behalf of political causes. But the younger Carter brings programming skills, not oratory or analysis, to the process. In a sense Jeff Carter and his brother Chip symbolize the growing relationship between candidates and computers. Both are combining their interest in politics and their talent for technical subjects.

In 1978, while pursuing a degree in geography at George Washington University, Jeff learned of a federal project to combine Census Bureau data with information from the National Oceanographic and Atmospheric Administration (NOAA). Relying on a mainframe, the project sought to display population data in map form. Budgetary problems arose, however, and support for the program diminished.

Carter's interest in the concept didn't wane when NOAA shelved the project. Shortly after IBM released the PC, he went to work on a PC-based software package that could do most of what the Census Bureau/NOAA collaboration promised. *Statmap* is the result, and this year Jeff Carter's pet project went commercial. The program gives candidates and their advisors an opportunity to view demographic data superimposed on a national or state map. The Reagan reelection campaign was reportedly among the first buyers. Rumor has it that Walter Mondale's staff also bought a copy.

William Myers, marketing support manager for the program, describes *Statmap* as a presentational tool. "Data shock—characterized by piles of data that you can't understand—is prevalent in campaigns. A visual tool like *Statmap* gives you control over the data," he says. Although the program is being used in the presidential race, he regards *Statmap* as a boon to candidates at all levels.

Myers has a simple theory about why the package is catching on. "Politicians are some of the least analytical people around; calculators even took time to enter the political arena," he says. "Politicians are accustomed to working on a personal basis. You won't get them to use software by devising gimmicks like a touch screen or a mouse. You've got to develop software so easy to use that politicians can 'see' its value."

Today, politicians can "see" the United States or France on *Statmap*. Eventually Carter hopes to create digital maps of the entire world.

While Jeff Carter was writing programs for politicians, his brother Chip was punching the keys of an IBM PC XT on behalf of Walter Mondale. As Mondale's deputy coordinator for 16 southern states, Chip was a key operative during the so-called "Super Tuesday" primaries in Georgia and Alabama—states that were big wins for Mondale.

PC World contacted Carter on the eve of the Georgia vote, briefly tearing him away from the XT where he was preparing to dispatch another 600 letters. Carter stopped just long enough to offer his impression of the impact of personal computers on campaigns. "Computers," he said, "are the biggest thing to hit politics since television."

polling. Introduced in the spring of 1983, *Campaign Manager* hit the campaign trail well ahead of most of its competitors. More than 1000 copies of the program have been sold, including three to Democratic presidential hopefuls.

For at least one member of Congress, *Campaign Manager* has been a decided plus. Representative Buddy Darden (D-Ga.), successor to the late Representative Larry MacDonald—killed when Korean Air Lines flight 007 was shot down—relied on the program in his race against MacDonald's widow, Kathleen.

John Thomas, Darden's political consultant, brought a PC and an Apple IIe into the campaign, then selected software. Thomas describes *Campaign Manager*'s role in the Darden bid as that of a tool, not a panacea. "In one sense, running a campaign is nothing more than organizing a tightly run business in a ridiculously short length of time," he says. "The computers and the software helped us use our time more efficiently."

● Community

Thomas put lists of all supporters and contributors into the *Campaign Manager* master file, then had the contacts grouped by geographic area. The PC did all the sorting and classifying—the kind of grunt work formerly done by volunteers. “Because we could see where our support was, we were able to discover where we were weak and where we needed to concentrate our efforts,” Thomas says.

The program helped bring order to the chaos that often characterizes a campaign office. “When Buddy was invited to a function, we would immediately use the scheduling program to call up his schedule on the screen and confirm the appointment on the spot,” Thomas explains. Using the PC also seemed to improve the Darden organization’s efficiency in communicating with voters. When someone expressed interest in the candidate or re-

In 1982 only 9 of Tobe's 52 principal clients used personal computers. This year 35 of 60 are relying on micros.

quested his position on an issue, a staff member would immediately dispatch a letter of thanks for the inquiry. “In prior years we would have gone to a mainframe,” Thomas says. “We would have dealt with higher costs, longer turnaround time, and letters that would not have been as personal.”

By election day, staff members were working on the PC in three shifts. Their high-tech approach helped generate contributions of \$320,000 in just nine weeks. Thomas is currently applying *Campaign Manager* to in-house polling and financial contribution monitoring chores.

Shaking Hands with Politech 1

Some political consultants tout *Politech 1*, from Politech Limited Partnership, as an even more versatile package. *Politech 1* is the brainchild of WordCom, a national mail-order house, and Analysis Group, a political polling and research firm. The principals of Analysis Group earned their credentials as pollsters and list managers for Senator Chris Dodd (D-Conn.) and for the presidential campaigns of Robert and Edward Kennedy. According to its designers, *Politech 1* compresses a \$15,000 mainframe-

size system into a program for the PC. For example, *Politech 1*'s voter-targeting module enables you to enter up to four years of election data, then cross-tabulate the results according to various demographic categories (age, race, sex, and income). The package also includes modules for list management, budgeting, media management, polling, and logging campaign activities.

Politech 1 and the PC are currently hard at work in Nebraska. As part of a project to create a statewide data base of voters and contributors, the Nebraska Democratic party has placed micros in the field and an IBM PC XT and System/36 at headquarters. Because Nebraska lacks a consolidated voter list, party volunteers are canvassing each county for voter registration information. They are then entering their findings, plus election histories and demographic data, into the party's PCs, which are equipped with *Politech 1*. This information, in turn, is sent by modem to the XT and finally to the System/36.

Marg Slominski, executive director of the Nebraska Democratic party, is encouraging local Democratic candidates to use the system. For now, list management entails moving files between the XT and the System/36 at state headquarters. With the addition of *Politech 1*, however, Slominski feels that computerized list management will be available at the local level, and she suggests that candidates in the lesser contests will soon be able to do their own targeting as well. Slominski also views *Politech 1*'s media management and campaign budgeting modules as a boon for local races. The media management component analyzes the costs and benefits of prime-time radio and TV advertising.

Politicians aren't procuring PCs and political software just to get elected; computers are also helping solons stay in office. For veteran California Assemblyman Louis Papan, a Democrat from suburban San Francisco, *Politech 1* has become part of a process that appears to have no end. “When you're an assemblyman and you're up for reelection every two years, it seems like you never stop running,” says Pat Sweetland, Papan's field representative. Papan is using the PC and *Politech 1* for basic list management, voter contact, and financial record keeping.

It is *Politech 1*'s talent for offering multiple views of contributors that Sweetland is finding especially useful. He's been using the program to examine the donor lists of the Papan campaign. On the PC he can rank contributors by size of gift, rank contributions by their source, discover the kinds of functions that elicit the most support, and discern the professions or groups that tend to donate to the campaign.

dCAMP, from PoliComp Associates, is a new package tailored for political campaigns of modest size. It consists of five modules (polling, volunteer management, scheduling, voter targeting, and financial reporting) and makes use of Ashton-Tate's *dBASE II RunTime*.

Political Programs

"Politics," an old saying goes, "is the art of the possible." A growing body of campaign-oriented software is helping political aspirants achieve the possible. Many of the packages that follow include individual modules for specific campaign tasks, such as scheduling, polling, and financial reporting.

CRS: The Campaign Reporting System
Poynor Computer Applications
6372 W. 82nd St.
Los Angeles, CA 90045
213/645-7265
List price: demonstrator kit \$50, one-committee packages \$795 to \$1495, two-committee package \$1895, each additional committee \$200
Requirements: 128K, 5MB hard disk, DOS 1.10 or 2.00

Solon
Q Systems Research Corporation
478 Morris Ave.
Summit, NJ 07901
201/522-1774
List price: \$16,000

Campaign Manager
Aristotle Industries
P.O. Box 21
Norwalk, CT 06853
203/853-6686
List price: \$499.95
Requirements: 128K, two disk drives, DOS 2.00

Politech 1
Politech Limited Partnership
31 Main St.
P.O. Box 537
Ellington, CT 06029
203/875-1234
List price: \$950
Requirements: 128K, one disk drive, DOS 2.00

dBASE II RunTime
Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
213/204-5570
List price: \$100
Requirements: 128K, one disk drive

dCAMP
PoliComp Associates
2522 Capitol Circle NE
Tallahassee, FL 32308
904/386-5128
List price: three modules (finance, organizer, schedule) \$995, polling module (written in CBASIC) \$995
Requirements: 128K, two disk drives (hard disk drive recommended)

Statmap
Ganesa Group International
1495 Chain Bridge Rd. #300
McLean, VA 22101
800/638-2225
List price: \$995
Requirements: 128K, two disk drives, graphics adapter (RGB monitor and plotter recommended)

David Meets Goliath

The PC works well alone, but its power and flexibility increase dramatically when it is linked to a larger computer. Several major political campaigns have augmented the PC for very ambitious tasks—and have found the enhancements invaluable. So reports Frank Tobe of Below, Tobe and Associates, one of the nation's largest suppliers of direct-mail and computer services to Democratic candidates. In 1982 only 9 of Tobe's 52 principal clients used personal computers. This year 35 of 60 are relying on micros.

California Assemblyman Tom Hayden is one Tobe client whose need for mass mailings was met by a micro hooked to a mainframe. Tobe loaded his big IBM machine with names and addresses of the 300,000 registered voters in Hayden's district. He then added demographic data to this massive file in preparation for targeted mailings. Because Hayden had a personal computer at his campaign office, he was able to supply a human touch to letters. Working from notes and insights

Community

gained while campaigning, he would enter pertinent voter information on the micro at headquarters, then use a communications program to telecommunicate that data to Tobe's mainframe. Letters were subsequently sent to key supporters and included additional information on issues or personal postscripts from Hayden.

The New Wave

What Al Jolson said about his act also applies to the personal computer's role in political campaigns: You ain't seen nothin' yet. That is certainly the conclusion of "Campaigns and Computers," a recent special issue of *Campaigns and Elections*, a journal devoted to the electoral process. Managing Editor Robert Abeshouse calls the personal computer "a great equalizer" in politics. "PCs bring political campaigns within the reach of many. The personal computer enables any citizen to get involved in fund-raising."

Other political observers are concerned, however, that too little attention is being paid to how personal computers ought to be used in campaigns. "You see the

Personal computers offer political campaigns more than efficiency and financial order.

same flaws in political packages that were initially present in management systems," says Earl Bender, a Washington-based political consultant. "You saw lots of clean report forms, but the designers had little understanding of how they were to be used." As a consequence, says Bender, some programs appear to be doing things that they cannot actually do. He is also wary of organizations that depend too much on even well-written software and wind up serving the machine more than the candidate. "Some campaigns begin to rely only on the computer and don't stop to apply intellect and sound management techniques," he contends.

Brian Lunde, director of the Democratic party's state-level Campaign '84 effort, looks at many PC applications and doesn't see much to get excited about. "Vendors are pitching all sorts of advanced software,

but candidates aren't using what they're pitching," he reports. Lunde estimates that the bulk of the campaigns that purchased political software are not using the media or polling modules of those programs—but suggests that such a gradual approach to automation is wise. "What candidates should be using are the modules that deal with the Federal Election Commission filing, word processing, list management, and scheduling. If they become too concerned with the *Star Wars* aspect of computing, campaigns can forget the basics—like sending a letter to an important contributor." Although his is a "go slow" approach, Lunde feels that the personal computer will inevitably serve as an electronic campaign manager for most small campaigns.

For financially strapped candidates personal computers may prove to be the only way to make ends meet. Federal and state reporting requirements have become so strict—and the cost of campaigning has risen so dramatically—that one political consultant suggests that running for office "virtually requires hiring an accountant." The PC's speed and efficiency can help in overseeing the budget, accounting, and campaign reporting.

Sam H. Kernell, a political science professor at the University of San Diego, thinks that personal computers offer political campaigns more than just efficiency and financial order. Kernell says that small computers are in keeping with the increasingly independent style of the American voter. Party loyalties are diminishing, he notes, and the rise of automation in politics is permitting candidates of all persuasions to woo voters in new ways. The Republican party, which "discovered" the political use of mainframes, may have pioneered sophisticated direct-mail and marketing approaches, but the microcomputer revolution has given computing power a small-*d* democratic flavor. Now everyone is potentially in the game. Tried-and-true strategies, as Kernell suggests, "just aren't enough anymore." ●

Jonathan Littman is a freelance writer who works in the San Francisco Bay Area.

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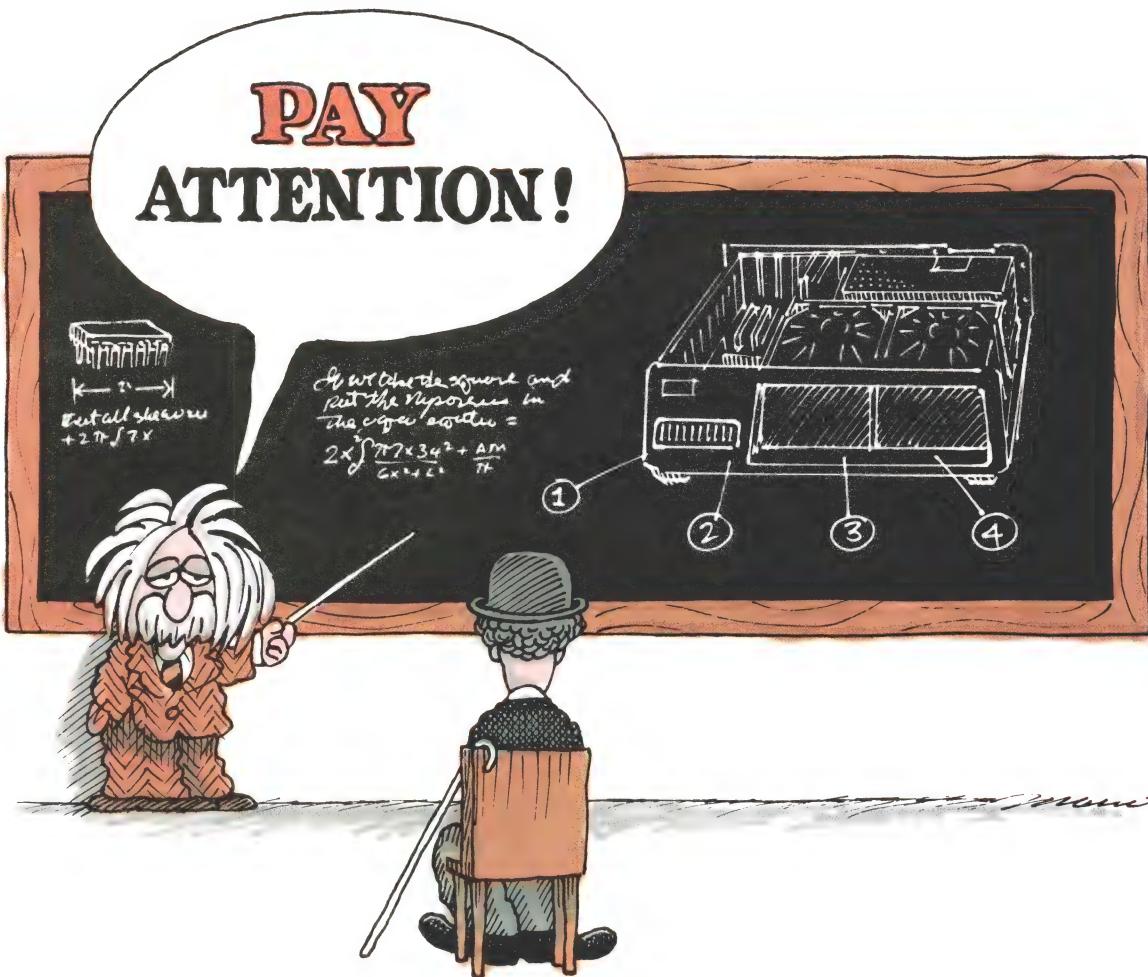
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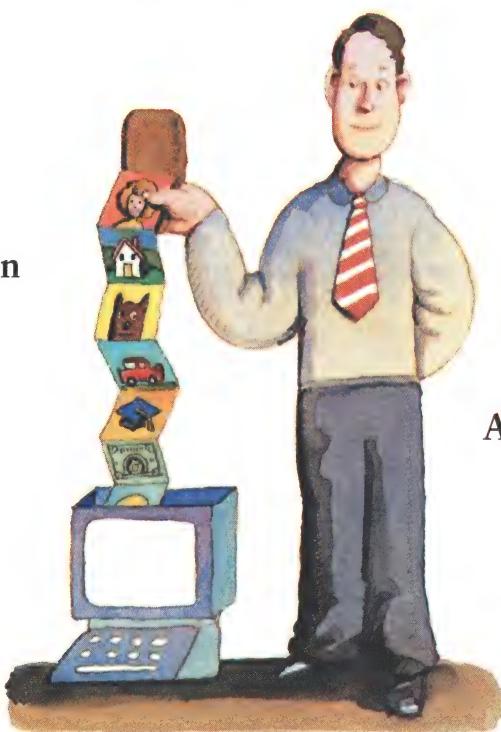
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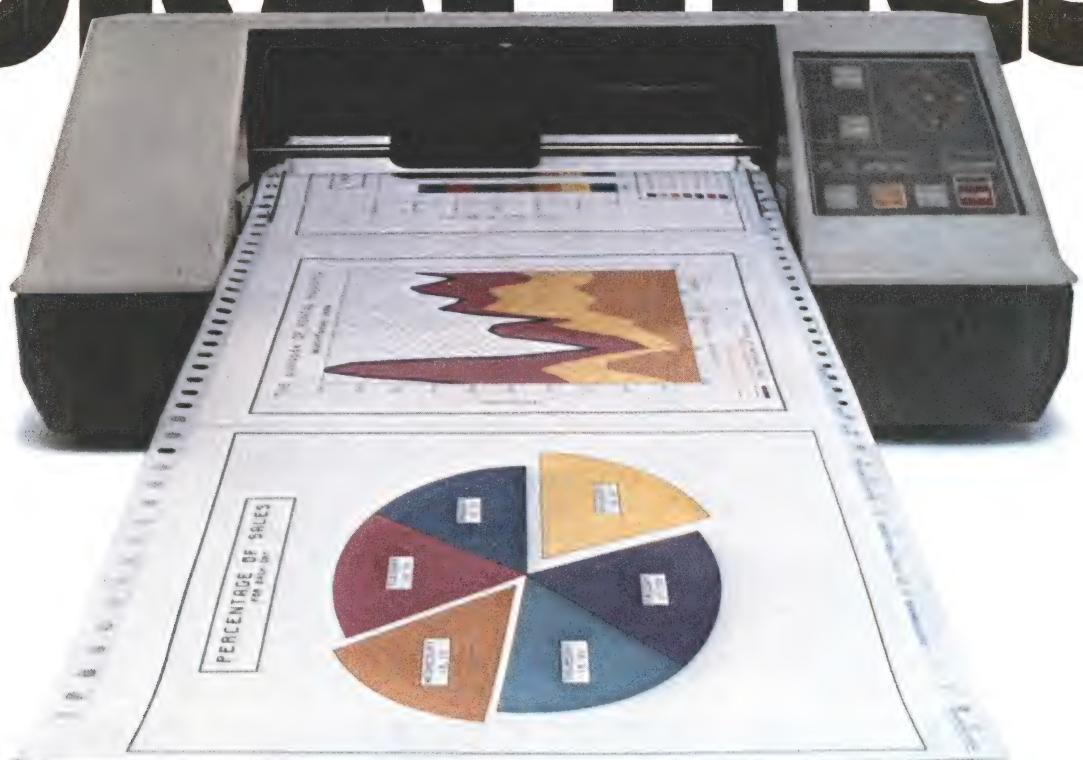
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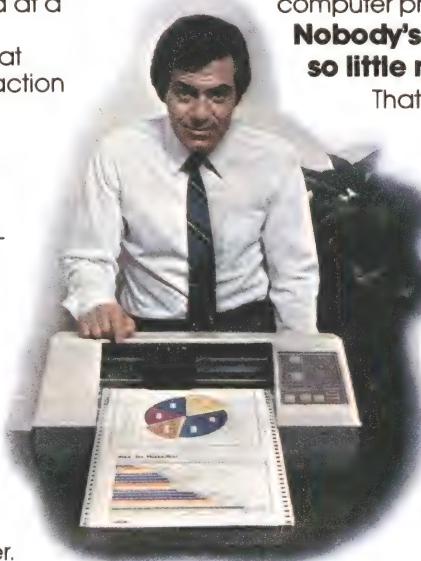
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Totally Unwarranted

The forbidding disclaimers posted on software packages don't tell the whole story. There are limits to how limited a warranty can be.

Phillip Gordon

Why should you spend your time on something you've been told is useless? If you've read this far, you have either sufficient faith that this article will contain something of value to you or sufficient time to waste if it doesn't. Such a judgment becomes more crucial, however, when more than time is involved—when, for instance, the cost of a software package is at stake. Yet most software packages include a disclaimer similar to the one in the previous paragraph. The disclaimer states that you are buying at your own risk, "as is," and if the software does not perform the functions you bought it for, tough luck; all the publisher will do is send you a new disk if the first one is bad—provided, of course, that you can prove you did not damage the disk by trying to use it.

What can you do if the software you buy fails to do what it is supposed to do? This issue is important to both business and home computer users. It may be more confusing for the latter group, since many consumers have little experience with personal computers or software. They buy software with the same expectations with which they would buy an appliance: they expect to get reason-

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able value for their money. The lack of consumer knowledge coupled with the lack of guarantees makes software one of the riskiest products you can buy.

The Warranty Umbrella

What happens if you buy a payroll package and your employees don't get paid for a month? Where do you turn if you buy an accounting package so bug-ridden that your business folds because you spent all your time playing programmer rather than watching your cash flow turn into a trickle? The laws governing a software buyer's rights are not yet clear, but there are a few rules with which you should be familiar. The world of

warranties and disclaimers controls your relationship with the dealers who sell and the companies that produce software.

It has long been recognized that both businesses and private consumers need some form of protection in the marketplace. Most sellers of goods are not incompetent or dishonest, but commerce can be complicated. In recognition of that fact, federal legislators have created a set of laws that spell out the responsibilities and rights of sellers and buyers.

The sale of "goods" is governed at the federal level by the Uniform Commercial Code (UCC). Goods are

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defined in the UCC as "movable" items, such as refrigerators and lamb chops. Although its purpose is to deal with "commercial transactions," that is, transactions between businesses, the UCC also applies to dealings between consumers and businesses.

The UCC defines three types of warranties that provide protection for buyers. The first is "express warranties"—anything written or spoken about the product. That includes advertisements and statements made by salespeople, not just statements that include the words *warranty* or *guarantee*. The maker and the seller of the goods can be held responsible for any inaccurate statements they make about a product.

Consumers are also protected by the "implied warranty of merchantability," which is based on the assumption that there is a tacit understanding between buyer and seller that an item will do what it is supposed to do. You can assume, for example, that a washing machine will clean clothes, a typewriter will produce typed copy, and a car will get you from point A to point B.

The last warranty set out by the UCC is the "implied warranty of fitness" given by a seller. This warranty is based on the assumption that a seller in some way gives you advice by selling you an item in response to a need you have expressed; by selling you the item, the seller implies that the product will fill that need. In some cases you don't even have to express the need directly. For example, in a restaurant it is assumed that the staff's knowledge will prevent them

from serving you tainted food. In buying software the implied warranty of fitness can be very important, since a salesperson's advice is often the crucial factor influencing a purchase.

Because software is in some ways a unique product, sold in ways that are not common to other "goods," there is still considerable debate over whether or not the UCC warranties apply to software sales. When you buy software, what you really buy is a disk and, usually, a license to use

Most judicial decisions have favored the consumer.

the program stored on it. The legal question of whether the sale of a license to use software is really a "sale" as covered by the UCC is not yet resolved. And software is not strictly movable "goods." You cannot hold software in your hand or carry it away with you; you can move only the disk, not the program. Software publishers claim that the only product they are selling is the disk that holds the software and that the software itself is distinct from the medium that contains it.

Until the courts settle these questions, a manufacturer or a dealer can always claim that their software is not covered by the UCC. However, the courts are not likely to agree with them; most judicial decisions have favored the consumer. Also, if the software is included with a sale of hardware, which is definitely "goods," the entire bundle is usually covered by any accompanying warranty.

Holes in the Umbrella

The UCC also provides protection for manufacturers. The UCC allows a manufacturer to disclaim any or all of the UCC warranties by simply attaching a written statement to the product announcing that any express and/or implied warranties are not in effect. IBM places such a disclaimer on all its software packages just under the shrink wrapping (see Figure 1).

A disclaimer that is not prominently displayed cannot protect the seller. If you buy software and find the disclaimer only after you unwrap the product, chances are that most courts will view the disclaimer as invalid. Also, some states do not allow manufacturers to disclaim the implied warranties.

Warranty disclaimers were first introduced to the computer industry by manufacturers of mainframe computer software and hardware. In that environment a disclaimer is perfectly fair because most of those sales are based on some kind of negotiated contract, with provisions covering expectations and responsibilities. The manufacturer can disclaim only responsibilities not covered in the contract.

But microcomputer software manufacturers have been quick to take advantage of the UCC's disclaimer loophole, claiming that a software manufacturer cannot possibly predict all the possible uses of a product, nor can it accommodate every level of user from novice to systems analyst. The easiest way out of the legal morass of responsibility for the manufacturer is to disclaim a product's fitness for any purpose—putting the responsibility squarely in the lap of the dealers and, ultimately, the customer.

This is an unfair burden to impose on dealers and consumers, because personal computer software buyers often don't know what features they need, much less what product they should buy. They can seldom test a piece of software before buying it.

Dealers and their salespeople likewise cannot test every product or know everything about the software they carry. But as long as manufacturers remain united in their disclaimers, the burden will remain where it is.

Patching the Holes

Warranty law has been extended beyond the UCC to explicitly cover "consumer" transactions through the Magnuson-Moss Consumer Warranty Act, a set of laws that cover the sale of "tangible personal property" to an individual, a family, or a household. The Magnuson-Moss Act limits the ability of a manufacturer to disclaim the implied warranties of fitness and merchantability, at least if a written warranty is given. If a software product is covered by a written warranty, a publisher can at best limit its liability for the implied warranties to the same period set for the written warranty.

If there is no written warranty, however, a publisher can legally disclaim all express and implied warranties. IBM tries to do this with its disclaimers and by not advertising its software very often, since ads can be considered an express warranty. But according to Daniel Remer, an attorney specializing in computer law and the author of *Legal Care for Your Software* (Nolo Press, Berkeley, California, 1983), since every sale is covered by an implied warranty under the UCC, the Magnuson-Moss Act may apply even to a product that has no written warranty, taking away a manufacturer's right to disclaim implied warranties under any circumstances.

While there has not yet been a significant number of court decisions testing the Magnuson-Moss Act, Remer feels that consumers can win in small claims court (or even in a full-fledged lawsuit) if they base their argument on the act's limitation on disclaimers.

But the Magnuson-Moss Act, like the UCC, was not drafted with software in mind. There is likely to be the same problem of legal definition as there was with the UCC. In this case the problem is whether or not software is "tangible personal property." The predisposition of the courts toward the consumer under the UCC will probably extend to Magnuson-Moss, however, so even if a definitive ruling that software is "tangible personal property" is not forthcoming, the consumer will still be in good shape.

Remer feels that the courts' consumer bent not only helps the purchaser but will ultimately help the software publishing industry as well. After publishers discover the shak-

iness of their disclaimers and the vulnerability of their software to consumer law, they will be forced to exercise better quality control and make more moderate claims for their software. That should result in software that is easier to use. The results: less computerphobia, more computer use, and fewer lawsuits against dealers and software publishers.

Protecting Yourself

Until the necessary legal battles are fought, there are ways you can safeguard your software investment. The law offers some protection to the consumer that cannot be totally disclaimed by manufacturers.

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THE PROGRAM IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU (AND NOT IBM OR AN AUTHORIZED PERSONAL COMPUTER DEALER) ASSUME THE ENTIRE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

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IBM does not warrant that the functions contained in the program will meet your requirements or that the operation of the program will be uninterrupted or error free.

However, IBM warrants the diskette(s) or cassettes on which the program is furnished, to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

Figure 1: IBM's limited warranty

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taking a case to a higher court, where a definitive judgment could be made. Most disputes between software buyers and dealers or manufacturers are settled out of court, often in favor of the consumer in return for the consumer's silence about a product's deficiencies.

There are ways, however, to settle problems with a dealer or a manufacturer without involving the legal system. You should first give the dealer and the publisher a chance to remedy the situation through patches, new releases, better documentation, or by refunding your money. Keep a record of your problems by saving letters that pass between you and the dealer and/or the manufacturer. A dealer will often work with you on software problems and extend the time limit on existing warranties if you document the problems you have during the warranty period.

Most software isn't as bad as the manufacturers' ominous disclaimers may lead you to believe. Most products will do what you've been led to believe they will. A more solid base of confidence is being built by the courts as they settle the software cases that will establish a software consumer's legal rights. Until then, let the buyer beware and take precautions. ●

It will be some time
before the laws cover-
ing software warranties
become as clear as
those that govern buy-
ing a car.

warranty from the dealer. It acts as a contract with the seller, setting out the specified obligations of the seller and the expectations of the buyer.

Even when a manufacturer is protected by a valid disclaimer, you may still have some recourse; a dealer is not protected by a manufacturer's disclaimer. A dealer can also use disclaimers under the UCC, but doing so would pose practical problems: a disclaimer inserted in a sales pitch would quickly cool a customer's enthusiasm.

It will be some time before the laws covering software warranties become well enough defined to make the responsibilities of the parties in software purchases as clear as those in buying a car. This is because the stakes are often too small to justify

Phillip Gordon is a senior systems analyst at a large financial institution in San Francisco.



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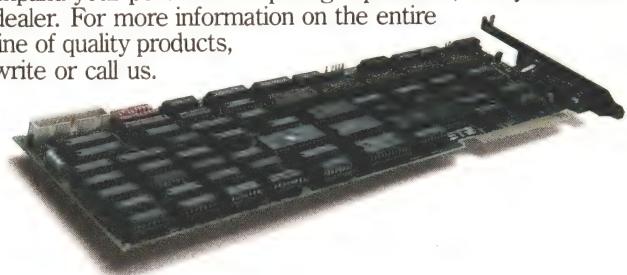
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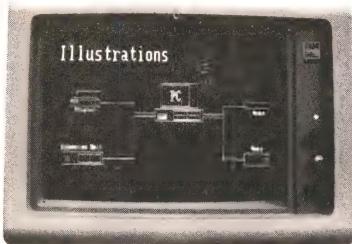
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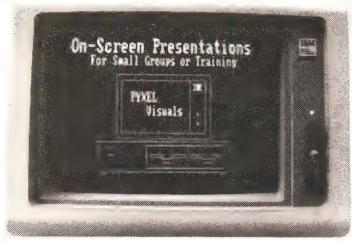
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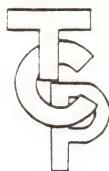
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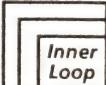
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The ULTIMATE Floppy Disk Backup & Repair Utility. Can back up ALL software protected disks written on the IBM PC. Works manually or automatically. Files or sectors can be restored, searched, examined & changed. Checks disk drive speed. Requires IBM PC, DOS 1.10(128K)/2.00(192K), + 64K if only 1 floppy drive. \$73 Ppd. USA. For info/MC/Visa: *MLI Microsystems, P.O. Box 825, Dept. PCWD, Framingham, MA 01701, 617/926-2055*

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ten by users with special emphasis on trouble-shooting. Order "The Secret WORD" now for \$14.95. TechnoLit Center, 1001 Connecticut Ave. NW #628, Washington, DC 20036, 202/293-0909

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A long time ago in a far away Directory, a file was created. Now try to find it! DR, FND and XTREE will search any or all sub-directories for single or multiple file specs. FND also adds wildcard specs to the FIND program. XTREE provides a complete disk map. All three utilities & manual for \$39.95. Digital Strategies, Inc., P.O. Box 273427, Boca Raton, FL 33427, 305/487-2699

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Your IBM/Epson printer does it all! Lay out pages any way imaginable: sideways, as a booklet, pamphlet. Set margins, char. set, style, size (to 35 char. per inch!). Preview on screen. Create & edit char. sets (20 included!). Complete online help, easy menus & more. DOS, 128K. Chk/MO. (PA + 6%). Digital Concepts, P.O. Box 8345, Pittsburgh, PA 15218

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Now your programs can access data files under DOS 2.00+ no matter where on your hard disk they are located. DPATH is a system-resident program that effectively extends the functionality of your DOS PATH command to include data files. Includes: interactive screen-oriented maintenance utility, & 60-page user manual. Req. PC-DOS 2.00. \$25. Personal Business Solutions, Inc., P.O. Drawer 757, Frederick, MD 21701

TXED Text Editor

Easy to use, powerful full-screen editor for beginning/advanced users. FAST. Edits 2 files concurrently (size is media bound). Cut/paste within & between files. Search (forward/backward), replace, hex conversion, directory, macros, & more. For IBM PCjr/PC/XT. Minimum 64K RAM, 1 disk. \$89. Progress Management Group, 10791 Tierrasanta Blvd. #104, San Diego, CA 92124, 619/268-4210

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FORMAT: The standard format includes a product ID, a 300-character descriptive ad, and the company name, address, and telephone number.

Advertisers may choose among categories already being used or may create their own. Display advertisers can cross-reference their current ad to the PC World Directory for increased exposure at low cost.

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DEADLINE: For space reservation deadlines, contact a PC World Directory sales representative at 415/861-3861. Please send copy and prepayment to: PC World Directory, 555 De Haro Street, San Francisco, CA 94107.

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Conversion from ASCII or EBCDIC 1600 BPI magnetic tape (up to 16K blocks) to most 5 1/4" single, dual or quad diskettes. High speed automated process verifies transfer. Quality guaranteed. Only FIVE CENTS per thousand characters plus \$3 per diskette. \$50 minimum.

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OKIDATA PACEMARK 2410 (350cps, 15")	\$2399
DIABLO P38 (400cps, 15")	\$1799
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GEMINI 15X (120cps, 15")	\$429
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TOSHIBA P1351 (LQ dot matrix, 15")	\$1499
TI-855 (LQ dot matrix w/font cart.)	\$799
EPSON LQ-1500 (LQ dot matrix)	CALL
DIABLO 630API (40cps LQ)	\$1749
DIABLO 630ECS (192 chars on wheel)	\$2099
NEC 2050 (durable, low cost LQ)	\$979
NEC 3550 (33cps LQ)	\$1749
NEC 7730 (55cps LQ)	\$1999
C.ITOH STARWRITER (40cps LQ)	\$1099
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QUME SPRINT 1155 (55cps LQ)	\$1599
BROTHER HR-25 (20cps LQ, 15")	\$699
DYNAX DX-15 (17cps, LQ, 10")	\$499

Hard Disk Drives:

SYSGEN 10MB HARD DISK (w/streamer)	\$2599
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SYSGEN IMAGE (back-up for XT)	\$849
TECMAR 10 + 5.15 + 5.33 + 5MB exp chassis)	from \$2699
DAVONG 10.15, 21, 35MB	from \$1595
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Multifunction Boards:

AST 6-PAK (64-384K, S.P.C.C., opt G)	from \$279
AST MEGA + (64-512K*, S.C.C. opt S.P.G.)	from \$269
AST I/O PLUS (S.C.C. opt S.P.G.)	from \$129
QUADBOARD I (64-256K, S.P.C.C.)	from \$279
QUADBOARD 384K (64K-384K, S.P.G.C.C.)	from \$289
TECMAR CAPTAIN (64-384K, S.P.C.C.)	from \$269
BABY BLUE II (64-256K, Z80B, 2S, P.C.C.)	from \$499
-all of these boards include utility software	
MAYNARD CONTROLLER CARDS	from \$189

Display Cards:

TECMAR GRAPHICS MASTER (640x400 + mono)	\$499
STB GRAPHIX PLUS (mono, color, par)	\$399
PROFIT MULTIGRAPH (mono, color, opt par)	\$399
QUAD COLOR I and II (color, hi/res/pega)	\$219
AMDEK MAI (mono, color, par, w/HALO)	\$399
PARADISE (mono, color, par)	\$429
HERCULES (hi/res mono, runs LOTUS)	\$359

Monitors:

AMDEK COLOR IV (720x480 bright colors)	\$549
AMDEK COLOR II + (color monitor)	\$399
AMDEK 300 A and G (Amber or Green)	\$149
AMDEK 310A (Amber, 1/2 IBM's price)	\$179
PGS SR-12 (690x480 non-interlaced)	\$699
PGS HX-12 (690x480 interlaced)	\$479
PGS MAX-12 (720x350 mono)	\$189

Modems:

HAYES 300 baud external	\$209
HAYES 1200 (300 or 1200 baud ext.)	\$489
HAYES 1200B (300 or 1200 baud int w/soft)	\$419
RIXON and U.S. ROBOTICS	CALL

Chips:

64K RAM CHIP MEMORY UPGRADE (set of 9) 200ns, full 90 day warranty	\$49
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Networks:

ORCHID PC NET PLUS STARTER KIT	\$1149
ORCHID PC NET PLUS NODE CARDS	\$549
ORCHID PC TURBO	CALL
3-COM ETHERSERIES (the original ethernet)	CALL

Miscellaneous:

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ISOBAR SURGE PROTECTORS (4 & 8 plug)	\$59
KEYTRONIC 5151 KEYBOARD (sep. cursor keys)	\$209
MOUSE SYSTEMS (optical mouse, runs LOTUS)	\$199
POWER BACK-UP (200 & 425 watts)	\$269
MICROFAZER (8-128K print buffer)	from \$139

Software:

MULTIMATE (emulates WANG dedicated WP)	\$299
MICROSOFT WORD (w/o w/mouse)	\$299
WORDSTAR PRO-PAK (new version)	\$369
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dBASE II (from Ashton Tate)	\$389
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IBM PC's for less:

IBM PC w/64K, 2 360K drives, controller	\$2149
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IBM PC w/256K, 2 360K half height drives, 10MB PEACHTREE PERIPHERALS internal hard disk, controller, AST 6-PAK, TECMAR GRAPHICS MASTER hi/res color and mono adapter, AMDEK COLOR IV hi/res color monitor, EPSON FX-100 w/cable	\$5399
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Circle 274 on reader service card

Just Announced

The wide world of PC products

Edited by J. Schaffner

In the fast-paced personal computer marketplace *Just Announced* keeps you apprised of the latest developments in IBM PC and compatible technology. Information for this department is provided by manufacturers; these write-ups are not reviews. Many of these descriptions will be followed up by reviews in future issues.

Hardware

Boards

Diamond Trackstar

An expansion board that lets an IBM PC run programs written for CP/M and Apple operating systems. Diamond Trackstar has a Z80A microprocessor for CP/M applications, a 6502B microprocessor for Apple programs, and a separate 6502B display controller to improve the resolution of the Apple screen output. The board supports monochrome, RGB, and composite monitors. Display size is 24 lines with 40 or 80 columns. Graphics resolution is 280 by 192 pixels with 16 colors. The board has 64K that can operate as a disk emulator. List price: \$695. Diamond Computer Systems Inc., 3380 Montgomery St., Santa Clara, CA 95050, 408/986-0100.

Modems

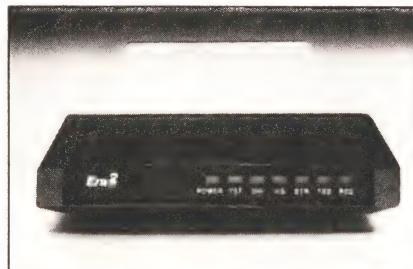
Companion

An external full-duplex modem that communicates at up to 1200 bps and comes with *Mite* communications software. It requires a serial port, 64K, and one disk drive. Features include automatic answering with speed detection, automatic redialing, tone and pulse dialing, and diagnos-



Companion, CTS

tics. Two telephone jacks provide both voice and data communication. The Companion operates asynchronously at 300 and 1200 bps and synchronously at 1200 bps. List price: \$495. CTS Corporation, 400 Reimann Ave., Sandwich, IL 60548, 815/786-8411.



SX/1200, Microcom

SX/1200

An external 1200 bps modem that communicates with computers and information services that support the Microcom Networking Protocol (MNP). It requires a serial port. The modem's MNP firmware allows data stream transfers, error detection and correction, and retransmission of lost data. The SX/1200 has automatic dialing and answering and stores up to nine telephone numbers. A rack-mount version is available. List price: \$599, rack-mount version \$579. Microcom, Inc., 1400A Providence Hwy., Norwood, MA 02062, 617/762-9310.

Tel-A-Modem

A modem combined with a desk telephone that has two lines for simultaneous voice and data communications. It requires a serial port. The full-duplex modem communicates at 300 and 1200 bps with automatic answering and speed detection. The



Tel-A-Modem, Code-A-Phone

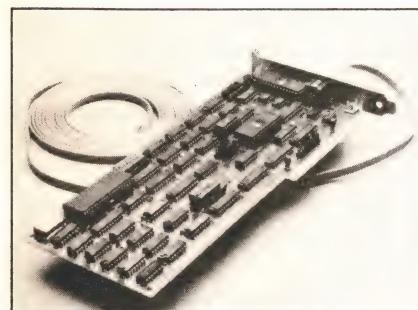
commands are the same as those for Hayes modems, so the modem is compatible with most communications software. LEDs on the telephone's faceplate indicate the modem's status. Telephone features

include automatic dialing and redialing, volume controls, and hold functions for both lines. List price: \$695.95. Code-A-Phone Corporation, 16261 S.E. 130th Ave., Clackamas, OR 97015, 503/655-8940.

Network Devices

AST-PCnet II

A distributed-bus, twisted-pair network for IBM PCs, XTs, and PCjrs that does not require dedicated print



AST-PCnet II, AST Research

and file servers. It requires 128K and one disk drive. AST-PCnet II links up to 32 PCs on a 500-foot cable; optional controller boards with repeater circuitry support four additional 500-foot, 32-node network sections. The network uses a Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) access protocol, provides file and record locking, and operates remote printers and disk drives with DOS commands. All software that runs on PCnet will run on AST-PCnet II. List price: for two PCs \$1290. AST Research Inc., 2121 Alton Ave., Irvine, CA 92714, 714/863-1333.

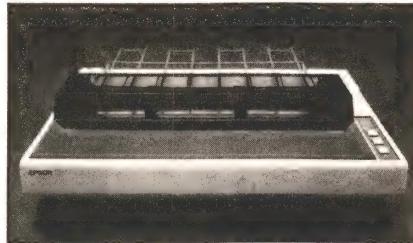
Starlink

Network hardware and software for connecting up to four terminals or microcomputers to an IBM PC. It requires 512K and two disk drives. The Starlink expansion board has its own 8088 microprocessor, 64K, and four serial ports for connecting the terminals. The board comes with a version of Concurrent PC-DOS that allows the computers to share files, data, and software. The operating system lets programs swap and update data, lets single or multiple terminals perform multiple tasks simultaneously, and lets the main console use multiple windows. Starlink comes with software drivers that let non-IBM terminals and microcomputers run software such as *WordStar*, *MBA Accounting*, *SuperCalc2*, *dBASE II*, *Multiplan*, and *Milestone Project Manager*. List price: \$1695. Digital Research, 160 Central Ave., Pacific Grove, CA 93950, 408/649-3896.

Printers

RX-100

A 9- by 9-dot printer that offers 136 columns for spreadsheets, ledgers,



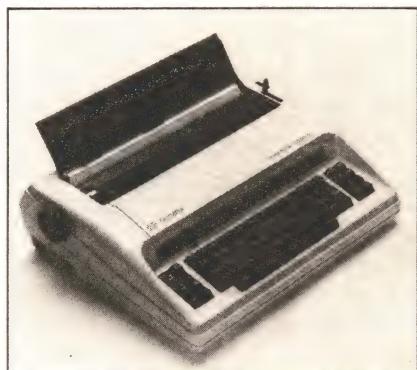
RX-100, Epson America

and other wide documents. It requires a serial or parallel port. The RX-100 prints at 100 characters per second and has a half-speed quiet mode. Features include 128 type styles, international character sets,

and dot-addressable graphics modes ranging from 60 to 240 dots per inch. The printer weighs 19 pounds and measures 23.3 by 15.5 by 5.2 inches. An IEEE-488 interface is available. List price: \$699, serial port with 2K buffer \$102. Epson America, Inc., 3415 Kashiwa St., Torrance, CA 90505, 800/421-5426, 213/539-9140.

Electronic Compact 2

A daisy wheel printer that doubles as a typewriter. It requires a parallel port. The Electronic Compact 2 prints 14 characters per second and has a switch for selecting operation as a printer. Typewriter features include a keyboard with a computer



Electronic Compact 2, Olympia USA

layout, access to all characters and symbols on the daisy wheel, three pitch selections, and a correction buffer of 40 characters. The machine measures 18 1/4 by 5 1/2 by 15 inches and weighs 20 pounds. An optional serial port has a 2K buffer with a key for repeat printout of the buffer. List price: \$599, serial port \$149. Olympia USA Inc., Box 22, Somerville, NJ 08876-0022, 201/722-7000.

Just Announced

DataPort

A letter quality daisy wheel printer that is the size of a notebook and weighs 5 pounds. It requires a parallel port. DataPort prints 80 characters per line at 15 characters per second.



DataPort, DataPort Computer Products

ters per line at 15 characters per second. The Elite 12 font has 96 characters, including computer characters. DataPort uses replaceable ink-jet units. List price: \$295, ink units \$3.50. DataPort Computer Products Research Facility, 5525 Olinda Rd., Bldg. A, El Sobrante, CA 94803, 415/223-3658.

Miscellaneous

Keyboard Extender

An extension cable that adds 5 feet to the length of the cord between the keyboard and the computer to allow more keyboard movement. The Keyboard Extender plugs into the existing sockets. List price: \$19.95. Bytes and Pieces, 550 N. 68th St., Wauwatosa, WI 53213, 414/257-3562.

SafeSkin

A molded keyboard cover designed to remain in place during keyboard use. SafeSkin protects the keyboard from liquid spills, dust, cigarette ashes, smoke, and other foreign matter. The cover is molded from an antistatic polymer and has tactile home row and numeric character locators. Keytops and side markings



SafeSkin, Merritt Computer Products

are visible through the cover. List price: \$29.95. Merritt Computer Products, Inc., 2925 LBJ Frwy. #180, Dallas, TX 75234, 214/942-1142.

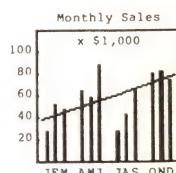
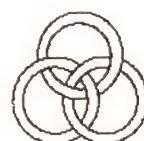
System Software

Languages

GL/M

A graphics language that generates precision graphics on daisy wheel and dot matrix printers. It requires 64K and one disk drive. GL/M (Graphics Language for Microcomputers) draws detailed figures; it is not a "screen dump" program. A picture may contain text, and when printed on a daisy wheel printer, the text has fully formed characters. GL/M supports Spinwriter, Diablo,

**SAMPLE DRAWINGS
SAMPLE DRAWINGS
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GL/M, Aspect

and compatible daisy wheel printers, and Epson, Anadex, and Prowriter dot matrix printers. List price: \$195. Aspect, 167 Worcester Rd., Wellesley, MA 02181, 617/431-7576.

ES/P

A third-generation program editor that simplifies the writing, debugging, modification, and maintenance of Pascal and C programs. It requires 192K, one disk drive, and the appropriate compiler. ES/P (Entry System for Programs) combines text-editing features with automatic syntax checking, automatic formatting, and automatic creation of program structures. You can enter text as usual, view the appropriate language structure at any point, or build an entire structure with one keystroke. ES/P warns of an unbalanced pair of quotes, parentheses, or brackets. Versions for UNIX and ADA are also available. List price: Pascal \$249, C \$349, Pascal and C \$399. Bellesoft, Inc., 2820 Northup Way #150, Bellevue, WA 98004, 206/828-7282.

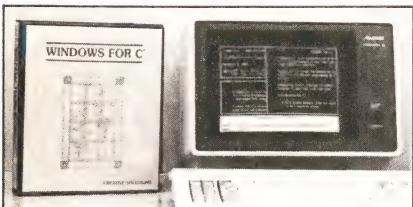
Utilities

Workload

A conversion program that translates ASCII files for use with programs such as 1-2-3, VisiCalc, and SuperCalc. It requires 128K and one disk drive. *Workload* automatically converts any ASCII report file into output formats such as WKS, DIF, SDI, and CSV. It loads each column of numbers and each column heading into columns of the spreadsheet. When you don't want to use the entire report, you can guide the program by selecting and rearranging particular items, or you can pick sections of the report and have *Workload* convert them automatically. List price: \$125. Management Science Associates, Inc., Shadyside Centre, 5100 Centre Ave., Pittsburgh, PA 15232, 412/683-9533.

Windows for C

A program and a library of subroutines that allow the screen to be divided into any number of windows. It requires 128K, two disk drives, and a C compiler (C86, Lattice C, Microsoft C, DeSmet C, or Aztec C). Library functions let you control the attributes of each window indepen-



Windows for C, Creative Solutions

An elegantly designed game that's a challenge at any level of play, from novice through expert. It will play itself, display play lists, check moves for legality and give you help whenever you want it—even select the best move for you.

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dently, overlay and restore screens, change attributes of text, and save window contents. Subroutines provide rapid screen changes without flicker or snow. *Windows for C* includes C source modules for viewing ASCII files in multiple windows, menu display and selection, cursor control, and text-mode bar graphs. List price: \$150. Creative Solutions, 21 Elm Ave., Richford, VT 05476, 802/848-7738.

Applications Software

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Dow Jones Software Accounting Series

An integrated family of accounting programs for small businesses. Each program requires 128K and a hard disk drive. The general ledger module has a flexible chart of accounts that does not restrict the type of chart used. Both the accounts payable and the accounts receivable programs can sort by up to 37 criteria and select an account that is the closest match to the information provided. All programs in the *Dow Jones Software Accounting Series* feature menus, text editors, prompts, error checking, numeric entry options, and an automatic audit trail. "What if" calculations let you create preliminary entries and statements without permanently altering the data. The series is integrated, so that information from accounts receivable or accounts payable is recorded in the general ledger. Inventory, management analysis, sales order entry, and purchase order entry modules will be available in 1985. List price: each module \$1000. Dow Jones Software, P.O. Box 300, Princeton, NJ 08540, 800/257-5114.

Beyond Board-Driven Networks

Business Management

GPSS/PC

A version of GPSS (*General Purpose Simulation System*) that predicts the effects of managerial or engineering decisions on complex, real-world systems. It requires 256K and one disk drive. GPSS/PC has on-line help, programmable function keys, keystroke error prevention, and partial command recognition. The program offers unlimited parameters per transaction, random number generators, and precision statistics accumulators. Interactive features include the ability to interrupt any action, simulate systems manually, access state variables and simulation primitives, and plot values as the program runs. An optional security device lets you run GPSS/PC without the master disk. List price: \$900, security device \$100. Minuteman Software, P.O. Box 171, Stow, MA 01775-0171, 800/343-0664 ext. 4800, in Massachusetts 800/322-1238 ext. 4800.

Communications

The Impersonator

A terminal emulation program that can govern any asynchronous communications, such as access to public data bases, file transfers, and electronic mail. It requires 192K, one disk drive, and a modem. *The Impersonator* offers emulation of seven common terminals and includes a programming language for creating other emulation programs. Five protocols are built into the program, including Xmodem and XON/XOFF. Using the macro command language,

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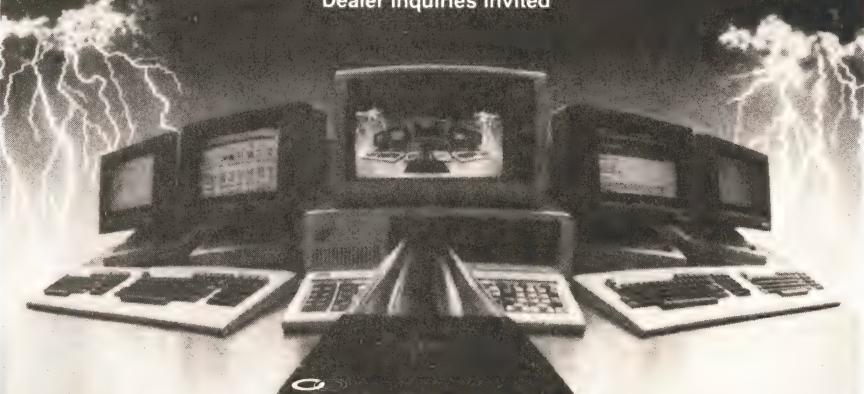


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you can design special logon sequences and transfers to be executed with one keystroke. *The Impersonator* handles differences in terminal keyboards and has character filters for swapping text between programs. Features include automatic dialing, unattended file transfers, error detection, and teletype and typewriter modes. List price: \$195. Direct.aid, Inc., P.O. Box 4420, Boulder, CO 80306, 303/442-8080.

Data Management

Aladin

A relational data base manager that has integrated modules for entering data, reporting, querying, performing calculations, working with statistics, and interacting with word processing packages. It requires 128K for DOS 1.10, 192K for DOS 2.00, and two disk drives. *Aladin* automatically sorts and indexes records when they are entered. The menu-driven program accommodates records of variable length and allows up to 2 million records per data base, up to 32 files and 512 fields per data base, up to 16MB per file, and up to 192 key fields. A modified B-tree structure speeds searches, including wild-card searches. Passwords and IDs can be assigned at device, function key, file, module, and field levels. *Aladin* can exchange files with programs such as WordStar, VisiCalc, 1-2-3, and dBASE II. It works with both the MS-DOS and p-System operating systems. A set of Pascal routines, called *Genie*,

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lets programmers build specific applications for an *Aladin* data base. List price: \$795, *Genie* \$500. Advanced Data Institute Inc., 1215 Howe Ave., Sacramento, CA 95825, 916/925-2229.

Educational

Language Lab

A language training system that teaches all skills necessary for fluency in a foreign language. It requires 64K, one disk drive, and an audio cassette player. In addition to syntax, usage, and vocabulary, *Language Lab* supplies performance reviews as listings and progress charts. The package includes pronunciation lessons on tape; an interactive audio cassette adapter starts and stops the tape player in conjunction with the lessons. The basic package covers three semesters of classwork, and optional additions let the student add advanced levels to the basic program or customize the lessons. *Language Lab* offers lessons in Spanish, French, Italian, and German. List price: \$235, each advanced level \$69. LampLighter Software, Inc., 7 Bretton Ave., Melville, NY 11747, 516/421-2653.

Entertainment

Vegas Craps

A game that lets up to three players bet on a roll of the dice. It requires 64K and one disk drive. *Vegas Craps* includes all bets except "don't," including "pass," "come," number bets, and the "sucker bets." Players can take odds on the "pass" line and on the numbers; appropriate odds are

paid for each roll. *Vegas Craps* stakes each player with \$500 and tracks winnings and losses. List price: \$29.95. Pro Systems, 6561 Gillis Dr., San Jose, CA 95120, 408/997-1776.

Graphics

G

A color graphics editor that uses the cursor as a pen and includes single-key commands for shapes such as circles, ellipses, arcs, and boxes. It requires 128K, a color graphics board, and one disk drive. With *G* you can erase, reposition, copy, mirror, or flip any image. The program includes functions that fill areas with color, control the cursor's speed and the line size, and change palettes and background colors. For experimenting with effects an Undo command reverses the last change made on the screen. *G* pictures can be incorporated into advanced BASIC programs and into programs in any other language if you have the *Halo* library for that language. List price: \$95. Micro Marketing Associates, 3497 E. Livingston Ave., Ste. A, Columbus, OH 43227, 614/231-4956.

Integrated Applications

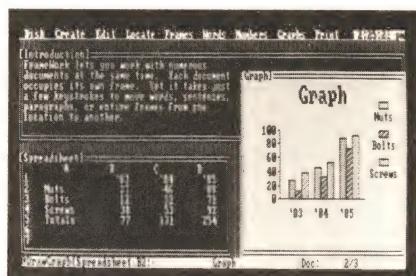
IOAS-3

A data base manager with integrated spreadsheet and word processing functions. It requires 128K and one disk drive. *IOAS-3 (Integrated Office Automation System)* has sort and merge facilities, security, and an interactive report writer. You can have

up to 32,000 records per data base and 512 bytes per record, and you can sort on up to ten fields simultaneously. Spreadsheet features include colors, sorts, searches, and bar charts. You can move totals of items and records from the data base directly into the spreadsheet. The word processor is a full-screen editor with word wrap, file merging, and on-line help. The program comes on five disks for the IBM PC and on two disks for the PCjr. List price: \$199. Micro Architect Inc., 6 Great Pine Ave., Burlington, MA 01803, 617/273-5658.

Framework

An integrated program that combines word processing, spreadsheet, business graphics, data management, and



Framework, Ashton-Tate

outline generation functions. It requires 256K and two disk drives. *Framework* includes a high-level programming language called Fred that can be used to alter any of the pro-

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gram's functions and to construct specific applications. Windowlike "frames" can include any combination of numbers, text, and graphs. DOS windows let you run other software within the program. *Framework* can use dBASE II, 1-2-3, and ASCII files. List price: \$695. Ashton-Tate, 10150 W. Jefferson Blvd., Culver City, CA 90230, 213/204-5570.

Job and Industry Specific

Credimax

A data base manager and accounting system for small credit unions with up to 2000 members and under \$2 million in assets. It requires an IBM PC XT, or the equivalent, with 128K. *Credimax* manages credit union accounts, including shares, certificates, IRAs, Christmas clubs, and loans. The relational data base offers multiple-key access and several levels of data protection and recovery in case of power failure. Automatic payroll deductions can be posted at any interval, split between accounts, and applied as automatic transfers. *Credimax* updates balances and totals and leaves an audit trail for general ledger accounts. The program can verify transaction totals prior to posting and automatically generate dividends that include withholding in special cases. Report capabilities include statements, credit union status, delinquent loans, 1099 and 1099R forms, amortization schedules, dividend registers, audit trails, and mailing labels. List price: \$5995. Syntropy, Inc., 250 West Fork Rd., C.R. 142, P.O. Box 2215, Durango, CO 81301, 303/247-3416.

Spreadsheets

Freecalc

A spreadsheet program with simple formulas that can be selected with a cursor for use in the spreadsheet. It requires 128K for DOS 1.10, 192K for DOS 2.00 and 2.10, and one disk drive. For beginners *Freecalc* provides three sample spreadsheets and a tutorial. Features for experienced users include an area for formula entry and the ability to handle unlimited expressions with as many nested parentheses as necessary. The spreadsheet has 100 rows and 25 columns. Suggested contribution: \$35; you can send a blank formatted disk and a postage-paid return mailer to receive a free copy. Stilwell Software Products, 16403 N. 43rd Dr., Glendale, AZ 85306.

Word Processing

IBM Displaywriter Series

A family of word processing programs that combine menu-driven functions of the Displaywriter system with commands and prompts for the PC, the XT, the PCjr, the Portable PC, and the 3270. *DisplayWrite 1*, which provides basic word processing for the home or office, requires 128K and one disk drive. *DisplayWrite 2*, which supports multiple-page documents and statistical tables

for use by professionals and administrative assistants, requires 192K and two disk drives. *DisplayWrite Legal Support* adds a legal dictionary to *DisplayWrite 2*. A cable and special software, the IBM Displaywriter/Personal Computer Attach Convenience Kit, connect the Displaywriter with your PC or Cluster, letting you transfer documents and files, share a hard disk, and exchange messages. List price: *DisplayWrite 1* \$95, *DisplayWrite 2* \$299, *DisplayWrite Legal Support* \$165, Displaywriter/Personal Computer Attach Convenience Kit \$495. IBM Direct, NDD, 1 Culver Rd., Dayton, NJ 08810, 800/426-2468.

Miscellaneous

Collector's Data Service

An on-line data base for collectors and connoisseurs that provides an international forum for buyers and sellers of rare items. The service has over 20 categories, including antiques, art, classic cars, yachts, and exotic real estate. To enter the system you dial your local Tymnet number, and the system verifies your credit card. A buyer can either leave a message or contact the seller directly. Collector's Data Service also lists stolen property, newsletters, events, auctions, and shows. Connect charges: 14 cents per minute and up. Ad rates: \$3 per month for ten-line ad. Collector's Data Service, Ltd., 420 W. Mercer, Seattle, WA 98119, 206/281-7273.

Publications

Directory of Public Domain (and User-Supported) Software for the IBM Personal Computer

A directory put out by the PC Software Interest Group that lists hundreds of public domain and user-supported programs available for the IBM PC and compatibles at little or no cost. Categories include word processing, communications, DOS and BASIC utilities, games, and spreadsheet templates. The book lists what programs are available and where to get them. PC Software Interest Group also supplies the programs themselves on disk. List price: \$4.95, introductory set of 10 disks \$59, complete set of 135 disks \$814. PC Software Interest Group (PC-SIG), 1556 Halford Ave. # 130S, Santa Clara, CA 95051, 408/730-9291.

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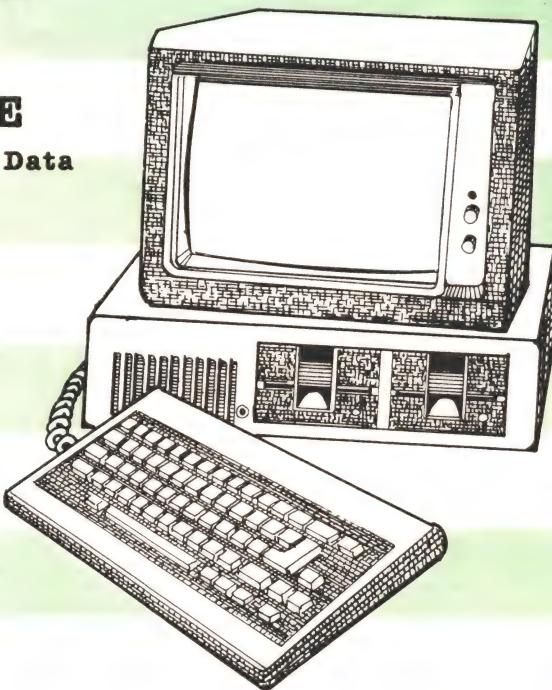
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Both 269

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C Compiler (DOS).... 309

Basic Compiler (DOS).. 249

Multiplan MS/DOS ... 139

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Others \$ Call

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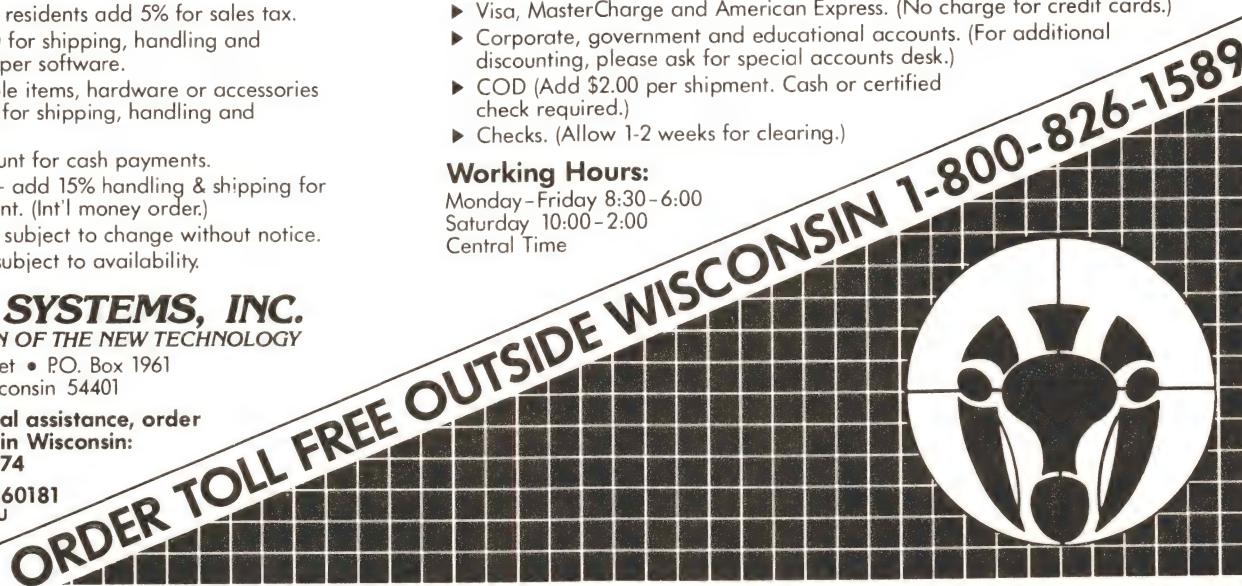
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Product Index

Reader
Service
Number

Computers

- 764 American Micronics, Inc., 238
15 Articulate Computer, Inc., 192
748 IBM, 28-29
248 Seequa Computer Corporation, 123
701 Televideo, 16-17

Hardware

Boards

- 18 AST Research, Inc., IFC, 1
24 Bizcomp, 160-61
579 Datec, 325
699 Everex, 144-45
Hercules Computer Technology, 23, 47
98 Maynard Electronics, 360
133 Orchid Technology, 91
107 PC Components, 71
243 Persyst, Inc., 62-63
468 Profit Systems, 65, 92
147 Pure Data Ltd., 256
605 Qubie' Distributing, 149
254 STB Systems, Inc., 315
261 Univation, 340
193 Ven-Tel, Inc, 15

Storage Devices

- 26 Chas-Moore, Inc., 316
643 Falcon Technology, Inc., 215
742 IDE Corporation, 38
683 Kamerman Labs, 36
537 Micro Design, 321
761 Micro Design Int'l, 80
475 Micro Tech Exports, 326
147 Pure Data Ltd., 256
605 Qubie Distributing, 125
Santa Clara Systems, Inc., 268
169 Sigma Designs, Inc., 307
188 Tallgrass Technologies Corp., 18
261 Univation, 340

Monitors

- 296 Princeton Graphic Systems, 147
726 Taxan Corporation, 148

Reader
Service
Number

Printers, Plotters, and Typewriter Interfaces

- 344 Dataproducts, 78-79
685 DataSouth Computer Corporation, 86
67 Florida Data Corp., 227
349 Hewlett Packard/Plotter Division, 163
627 Juki America, 257
285 Toshiba America, Inc., 188-89

Communications

- 397 CXI, Inc., 364-IBC
462 Lockheed, 293
149 Quadram Corporation, 39
605 Qubie Distributing, 50-51

Miscellaneous

- 50 Cuesta Systems, Inc., 351
Curtis Manufacturing Company, 73
113 General Electric Microwave Products Department, 241
Microsoft, 2-3
753 Mindset Corporation, 176-77
605 Qubie Distributing, 89

Systems Software

Utilities

- 760 Borland International, 26-27
166 Coefficient Systems Corp., 174
270 Computer Control Systems, Inc., 318
765 DKI, 326
71 Fox & Geller, Inc., 127
74 Funk Software, 291
708 H.F. Computing Service, Inc., 236
573 Micro Focus, 207
133 Orchid Technology, 91
142 Persoft, Inc., 121
575 Photon Software, BC
766 Pyxell Applications, 318
673 Quaid Software Limited, 346
160 Rickerdata, 324
163 RTCS Corporation, 244
52 Softhelp, Inc., 102
174 Soft Right, 346
190 Tecmar, Inc., 198, 222-23
194 Vertex Systems, 157
698 Writing Consultants, 322

Reader
Service
Number

Languages

- 55 BMB Software Specialties, 325
406 Computer Innovations, Inc., 325
92 Lifeboat Associates, 269
231 Mark Williams Company, 115
100 MBP Software Systems Technology, 287
Microsoft, 103
118 MicroWare, Inc., 320

Applications Software

General Business

- 772 Analex Computing, Inc., 146
658 Concentric Data Systems, 37
170 Software Strategies, Inc., 229

Financial & Spreadsheets

- 747 Barron Ross, 260
532 Future's Group, 326
H & E Computronics, Inc., 25
409 Heritage Computing, Inc., 20
25 Prentice-Hall/Lumen Software, 175
Software Services of Tampa, Inc., 162
647 Timberline Software, 19
704 Zylab/ General Business, 326

Job and Industry Specific

- 410 Softstyle, Inc., 316
182 Structural Programming, Inc., 236, 322

Data Management

- 354 CDI Information Systems, 194-95
51 Condor Computer, 228, 240
221 Hayes Microcomputer Products, Inc., 190-91
Quest Research, Inc., 239

Word Processing/Text Editing

- IBM, 8-9
93 Lifetree Software, 173
Multimate International, 278-79
533 Office Solutions, 53
399 Palantir, 245
165 Satellite Software International, 90

Communications

- 624 Inner Loop Software, 326
623 Lindbergh Systems, 143
682 Menlo Corp., 196-97
275 Microstuf, 270
133 Orchid Technology, 93
526 Software Link, Inc., 347
769 3Com Corporation, 180-81

Graphics

- 342 Decision Resources, 164
62 Digital Research, 48-49
71 Fox & Geller, Inc., 127
502 Graphic Communications, Inc., 24
530 IMSI, 157
332 MICROGRAFX, 35
138 Nicolet Computer Graphics Division, 310
506 Sam Wilson & Associates/Banner, 326

Integrated Systems

- 6 Alpha Software Corp., 12
741 Ashton-Tate, 126
Innovative Software, 150-51
81 Martin Marietta/It Software, 111
119 Modtech/Lytron Systems, 237
175 Softrend, 76-77

Educational, Personal, Entertainment & Misc. Software

Educational

- 7 American Training International, 5
20 Creative Software, 87
589 Spectrum Holobyte, Inc., 14

Personal

- 710 Business Technotics, 266
321 Pacific Data Systems, Inc., 255
25 Prentice-Hall/Lumen Software, 175

Entertainment

- Bluebush Incorporated, 345
752 Silverman Associates, 324
589 Spectrum Holobyte, Inc., 14
308 subLOGIC Corporation, 104

Miscellaneous

- 758 Connecticut Software, 159
Lassen Software, Inc., 351

General

Accessories

- 767 Attaché Software, Inc., 52
9 Bytes & Pieces, 324
276 Contemporary ComputerWear, 322
646 Control Data Corporation, 124
634 Creative Computer Products, 258
289 Dennison Computer Supplies, 226
578 Maxell, 166-67
576 Pacific Exchanges, 327

Services

- 31 Central Point Software, Inc., 225
362 Compuserve, 165, 193
Preview Publishing, 40-41
Safeware, 285

Books, Catalogs, and Periodicals

- Microsoft Press, 30
19 Prentice-Hall/General Publishing, 259

Mail Order

- 2 Advanced Computer Products, 323
205 Applied Computer Products, Inc., 178-79
90 Compuclassics, 289
273 Compumail, 214
754 Computer Discount Products, 306
420 Computer Mail Order, 352-53
626 Computers and More, 286
488 Connecticut Information Services, 254
554 Conroy La Pointe/Computer Exchange, 112-13

- 110 Creative Microsales, Inc., 314

- 58 Diamond Software, 114

- Disk World!, 327

- Diskette Connection, 325

- Economy Software, 282

- 214 800 Software, 309

- 768 47th Street Photo, 246-47

- 95 Logicsoft, Inc., 276

- 652 Macrotron Systems Corp., 327

- MC-P Applications, 288

- 108 Micro Flash Computer Systems, Inc., 305

- 386 Micro Management Systems, Inc., 324

- 112 Micro Mart, 122, 362-63

- 619 Micro Match, 327

- 681 Oryx Systems, 354-55

- 136 PC Connection, 128-131

- 242 PC Link Corp, 290

- 460 PC Network, 292

- 626 PC Pipeline, 326

- 274 Progressive Micro Distributors, 341

- 586 Ramware Software Products, 171

- 380 Rogue River Software, 320

- 185 Systems Mart, 326

- 705 Team Computer Products, 267

- 731 Wildcat Computing, 326
Woodinville Computer Center, Inc., 348

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Reader
Service
Number

- 2 Advanced Computer Products, 323
- 6 Alpha Software Corp., 12
- 764 American Micronics, Inc., 238
- 7 American Training International, 5
- 772 Analex Computing, Inc., 146
- 205 Applied Computer Products, Inc., 178-79
- 15 Articulate Computer, Inc., 192
- 741 Ashton-Tate, 126
- 18 AST Research, Inc., IFC, 1
- 767 Attaché Software, Inc., 52
- 747 Barron Ross, 260
- 24 Bizcomp, 160-61
- Bluebush Incorporated, 345
- 55 BMB Software Specialties, 325
- 760 Borland International, 26-27
- 710 Business Technetics, 266
- 9 Bytes & Pieces, 324
- 354 CDI Information Systems, 194-95
- 31 Central Point Software, Inc., 225
- 26 Chas-Moore, Inc., 316
- 166 Coefficient Systems Corp., 174
- 90 Compuclassics, 289
- 273 Compumail, 214
- 362 Compuserve, 165, 193
- 270 Computer Control Systems, Inc., 318
- 754 Computer Discount Products, 306
- 406 Computer Innovations, 325
- 420 Computer Mail Order, 352-53
- 629 Computers and More, 286
- 658 Concentric Data Systems, 37
- 51 Condor Computer, 228, 240
- 488 Connecticut Information Services, 254
- 758 Connecticut Software, 159
- 554 Conroy La Pointe/Computer Exchange, 112-13
- 276 Contemporary ComputerWear, 322
- 646 Control Data Corporation, 124
- 49 Corvus Systems, 88
- C.P. Aids, 361
- 634 Creative Computer Products, 258
- 110 Creative Microsales, Inc., 314
- 20 Creative Software, 87
- 50 Cuesta Systems, Inc., 351
- Curtis Manufacturing Company, 73
- 397 CXI, Inc., 364-IBC
- 718 Data Base Co., 327
- 344 Dataproducts, 78-79

Reader
Service
Number

- 685 DataSouth Computer Corporation, 86
- 579 Datec, 325
- 342 Decision Resources, 164
- 289 Dennison Computer Supplies, 226
- 58 Diamond Software Supply, 114
- 62 Digital Research, 48-49
- Disk World!, 327
- Diskette Connection, 325
- 765 DKI, 326
- Economy Software, 282
- 214 800 Software, 309
- 699 Everex, 144-45
- 643 Falcon Technology, Inc., 215
- 67 Florida Data Corp., 227
- 768 47th Street Photo, 246-47
- 71 Fox & Geller, Inc., 127
- 74 Funk Software, 291
- 532 Future's Group, 326
- 113 General Electric Microwave Products Department, 241
- 502 Graphic Communications, Inc., 24
- 221 Hayes Microcomputer Products, Inc., 190-91
- H & E Computronics, Inc., 25
- Hercules Computer Technology, 23, 47
- 409 Heritage Computing, Inc., 20
- 349 Hewlett Packard/Plotter Division, 163
- 708 H.F. Computing Service, Inc., 236
- 748 IBM, 28-29
- IBM, 8-9
- 742 IDE Corporation, 38
- 530 IMSI, 157
- 624 Inner Loop Software, 326
- Innovative Software, 150-51
- 627 Juki America, 257
- 683 Kamerman Labs, 36
- Lassen Software, Inc., 351
- 92 Lifeboat Associates, 269
- 93 Lifetree Software, 173
- 623 Lindberge Systems, 143
- 462 Lockheed, 293
- 95 Logicsoft, Inc., 276
- 652 Macrotron Systems Corp., 327
- 231 Mark Williams Company, 115
- 121 Markel Services, 322
- 81 Martin Marietta/ It Software, 111
- 578 Maxell, 166-67

Reader
Service
Number

- 98 Maynard Electronics, 360
- 100 MBP Software Systems Technology, 287
- MC-P Applications, 288
- 682 Menlo Corp., 196-97
- 537 Micro Design, 321
- 761 Micro Design Int'l, 80
- 108 Micro Flash Computer Systems, 305
- 573 Micro Focus, 207
- 332 MICROGRAFX, 35
- 386 Micro Management Systems, Inc., 324
- 112 Micro Mart, 122, 362-63
- 619 Micro Match, 327
- 275 Microstuf, 270
- Microsoft Corporation, 2-3, 103, 105
- Microsoft Press, 30
- 292 Micro-Tax, 33
- 475 Micro Tech Exports, 326
- 118 MicroWare, Inc., 320
- 753 Mindset Corporation, 176-77
- 119 Modtech/Lytron Systems, 237
- Multimate International, 278-79
- 138 Nicolet Computer Graphics Division, 310
- 533 Office Solutions, 53
- 133 Orchid Technology, 91, 93
- 681 Oryx Systems, 354-55
- 321 Pacific Data Systems, Inc., 255
- 576 Pacific Exchanges, 327
- 399 Palantir, 245
- 107 PC Components, 71
- 136 PC Connection, 128-131
- 242 PC Link Corp., 290
- 460 PC Network, 292
- 626 PC Pipeline, 326
- 142 Persoft, Inc., 121
- 243 Persyst, Inc., 62-63
- 575 Photon Software, BC
- 25 Prentice-Hall/Lumen Software, 175
- 19 Prentice-Hall/General Publishing, 259
- Preview Publishing, 40-41
- 296 Princeton Graphic Systems, 147
- 468 Profit Systems, 65, 92
- 274 Progressive Micro Distributors, 341
- 147 Pure Data Ltd., 256
- 766 Pyxell Applications, 318
- 149 Quadram Corporation, 10-11, 39
- 673 Quaid Software Limited, 346

- 605 Qubie' Distributing, 50-51, 89,
125, 149
Quest Research, Inc., 239
586 Ramware Software Products, 171
160 Rickerdata, 324
380 Rogue River Software, 320
163 RTCS Corporation, 244
Safeware, 285
506 Sam Wilson & Associates/
Banner, 326
Santa Clara Systems, Inc., 268
165 Satellite Software International, 90
248 Seequa Computer Corp., 123
169 Sigma Designs, Inc., 307
752 Silverman Associates, 324
52 Softhelp, Inc., 102
744 SoftLogic Solutions, Inc., 277
175 Softrend, 76-77
174 Soft Right, 346
410 SoftStyle, Inc., 316
526 Software Link, Inc., 347
Software Services of Tampa,
Inc., 162
170 Software Strategies, Inc., 229
589 Spectrum Holobyte, Inc., 14
254 STB Systems, Inc., 315
182 Structural Programming, Inc., 236,
322
308 subLOGIC Corporation, 104
185 Systems Mart, 326
188 Tallgrass Technologies
Corporation, 18
726 Taxan Corporation, 148
705 Team Computer Products, 267
190 Tecmar, Inc., 198, 222-23
701 Televideo, 16-17
769 3Com Corporation, 180-81
647 Timberline Software, 19
285 Toshiba America, Inc., 188-89
261 Univation, 340
193 Ven-Tel, Inc., 15
194 Vertex Systems, 157
Western Union, 80-81
731 Wildcat Computing, 326
Woodinville Computer Center,
Inc., 348
698 Writing Consultants, 322
704 Zylab/General Business, 326

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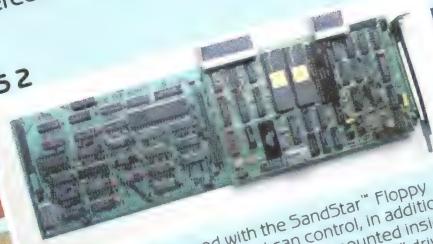
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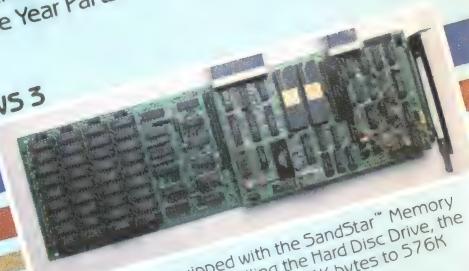
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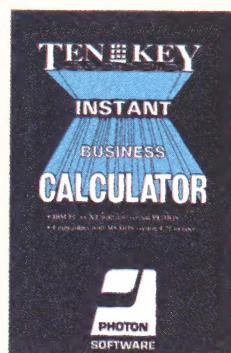
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